

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use this microcard		1	2	3		4
A01 = Structure of microcard					SIS	
E01 = Trouble-shooting chart	-A-	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	-B-	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-C-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-D-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-E-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	-F-	XXXXX	XXXXX	XXXXX	XXX	
	-G-	XXXXX	XXXXX	XXXX		
	-H-					
	-J-					
	-K-					
	-L-					
	-M-					
N01 = Service information	-N-	*XXXX	XXXXX	XXXXX	XXX	*X XX*
		12345	67890	12345	67890	12345 678
			1		2	
						Index

N28 = Table of contents and publication information

- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Testers and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section

A01		
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HOW TO USE THIS MICROCARD

Trouble-shooting instructions for system:

L3.2 - Jetronic

Description, photographs, terminal designations and special features refer to vehicle:

ALFA 33 1.7 i.e.  
with 1.7 l / 4-cylinder engine 10.87 ->

These basic instructions represent detailed trouble-shooting instructions. They are not to be used as vehicle-specific instructions.

Caution!  
Descriptions and photographs may deviate from the vehicle-specific brief instructions.

Binding set values, terminal assignments and special features are only to be taken from the vehicle-specific brief instructions.

For brief instructions, please refer to Microcard Overview KFZ-0...

A02		
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## SPECIAL FEATURES

- \* L3.2 - Jetronic
- \* 15-pole control unit
- \* Control unit attached directly to air-flow sensor.
- \* Air-flow sensor is connected to control unit via an internal 4-pole plug connection.
- \* Air-flow sensor with no bypass channel and CO adjusting screw.
- \* CO adjusting screw on control unit.
- \* Pump relay instead of control relay.  
The pump relay is actuated by the control unit.
- \* Plausibility, i.e. a substitute value, e.g. +80°C, is provided by the control unit in the event of defective sensors or leads, such as engine temperature. This applies to the following sensors:  
temperature sensor (engine),  
temperature sensor (intake air),  
throttle-valve switch (idle),  
throttle-valve switch (full load).
- \* The air-flow-sensor signal is brought out for further applications at the control-unit plug.
- \* Start control, i.e. additional quantity of fuel injected by way of all injection valves.
- \* Lambda closed-loop control with heated sensor and t v coding, (t v = response-delay time).

## SPECIAL FEATURES (CONTINUED)

- \* Triggering of injection at control unit term. 1 by way of ignition pulses from term. 1 or by way of TD square-wave signals from ignition trigger box.
- \* Altitude correction at term. 7 by way of pressure sensor. Vehicles with no pressure sensor feature a jumper between term. 2 and term. 7 so that the lambda system provides closed-loop control.
- \* Multiple assignment term. 6
  - Basic function = t v coding for lambda closed-loop control.
  - At least 2s to ground = Diagnosis stimulation.
- \* Multiple assignment term. 10
  - Basic function = Sensor monitoring.
  - Idle and full-load contact closed = Test output for lambda closed-loop control.
  - Following stimulation at term. 6 = Diagnosis output.
- \* Tank ventilation system with active-carbon container. Ventilation controlled as a function of load by way of throttle-valve position.
- \* For supplementary system information, see Service Information "New System L3-Jetronic" on Microcard PKW-038 Coordinate N 05.

## SAFETY AND PRECAUTIONARY MEASURES

Be sure to observe safety and precautionary measures so as to avoid risk to persons and to prevent damage to the engine, trigger boxes, control units or the ignition system.

### CAUTION!

High-energy ignition system with dangerous high and low voltages!

Touching live parts or terminals may be highly dangerous (both on the primary and secondary sides).

For testing of compressions pressure, disconnect pump relay in order to prevent undesired injecting of the injection valves.

Do not short-circuit ignition coil term. 1 to ground (e.g. for switching off the engine). Ignition coil and possibly control unit will be destroyed.

Never connect positive pole of battery to ignition coil term. 1. Control unit will be destroyed.

If installing an alarm system, follow installation instructions for L-Jetronic vehicles or SIS microcard PKW 012. Make sure that the alarm relay is not disturbed by external fields (e.g. from ignition leads), thus incorrectly triggering.

## SAFETY AND PRECAUTIONARY MEASURES (CONTINUED)

Never start engine without battery securely connected (battery terminals tightened). Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine.

Provide starting assistance only with second 12 V battery and jump leads.

Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or providing starting assistance, follow the operating instructions for the fast charger as well as instructions of the vehicle manufacturer.

Disconnect battery from vehicle electrical system before charging or fast-charging.

Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of a control unit.

Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

Remove control units at temperatures above + 80° C (paint-drying installation).

Remove control units before carrying out electric welding work.

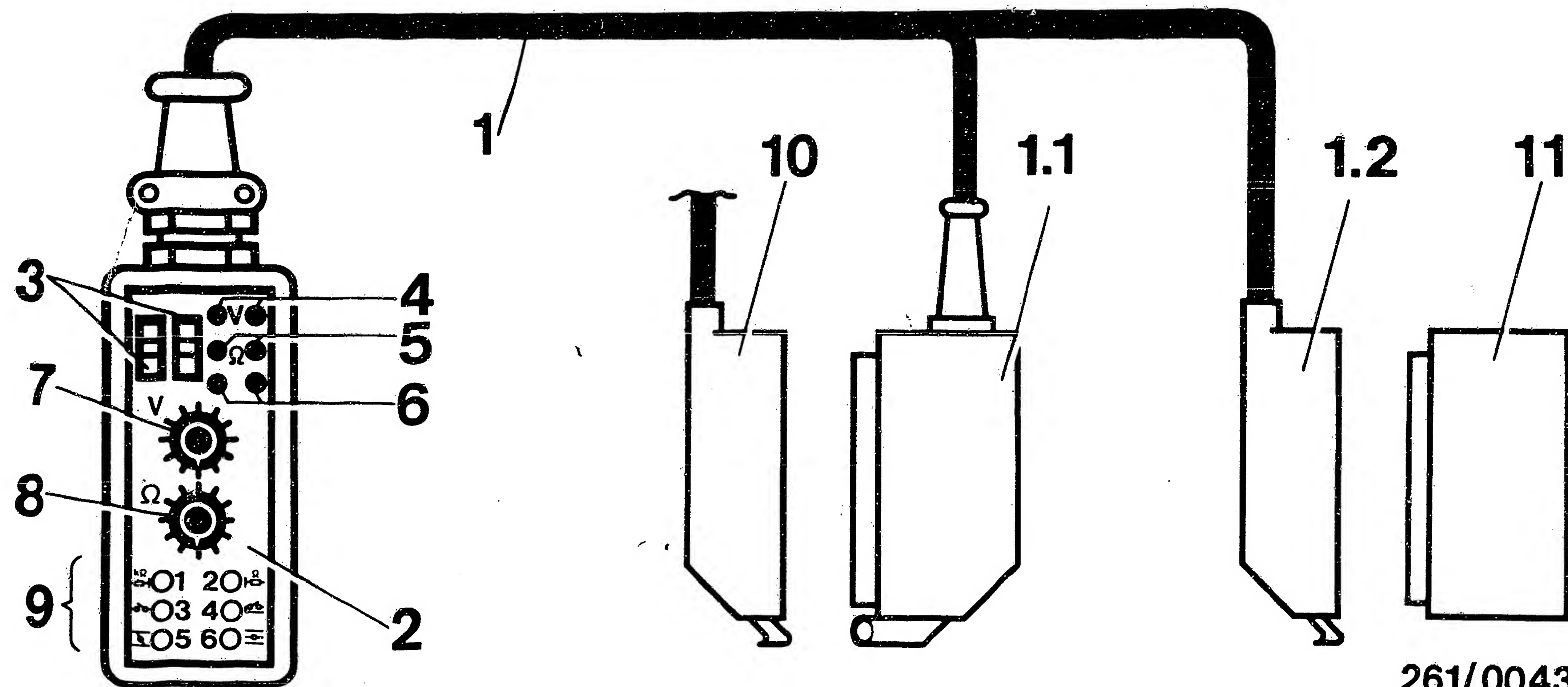


## TESTERS AND TOOLS

Name	Designation	Part No.
Universal test adapter	ETT 018.01	0 684 101 801
Adapter lead		1 684 463 168
Motor tester e.g.	MOT 201	0 684 000 201
	MOT 300	0 684 000 300
	MOT 400	0 684 000 400
Test lead		1 684 463 093
Test leads for proper connection		KDZS 0004 KDUM 0008
Digital multimeter e.g.	MMD 301 Fluke Co.	0 684 500 301 75 or 77
CO analyzer e.g.	ETT 008.14 ETT 008.15	0 684 100 814 0 684 100 815
Pressure measuring device or pressure gauge		KDJE-P 100
	Meas. range 6 bar Scale div. 0.1 bar Quality class 1.0	
Three-way line Connection part	KDJE-P 100/14 or	KDJE-P 100/13 KDJE-P 100/16
Set of parts for sol.-op. injection valve, pressure regulator		1 287 010 704
Mounting paste for lambda sensor	VS 14016 Ft 120g 450g	5 964 080 112 5 964 080 145
Vacuum hand pump	Mityvac Pump L.-Kloos-Str.21	Korinth Co. 6450 Hanau 7
Sleeve-type supp. 5k $\Omega$		0 356 500 001
Temperature sensor		0 280 130 028
1 battery 1.5 V (unicell) for simulation of lambda-sensor voltage.		Commercially available
Pressing-on tool for CO intervention safeguard		Commercially available

For production reasons:  
continued on the following  
coordinate.

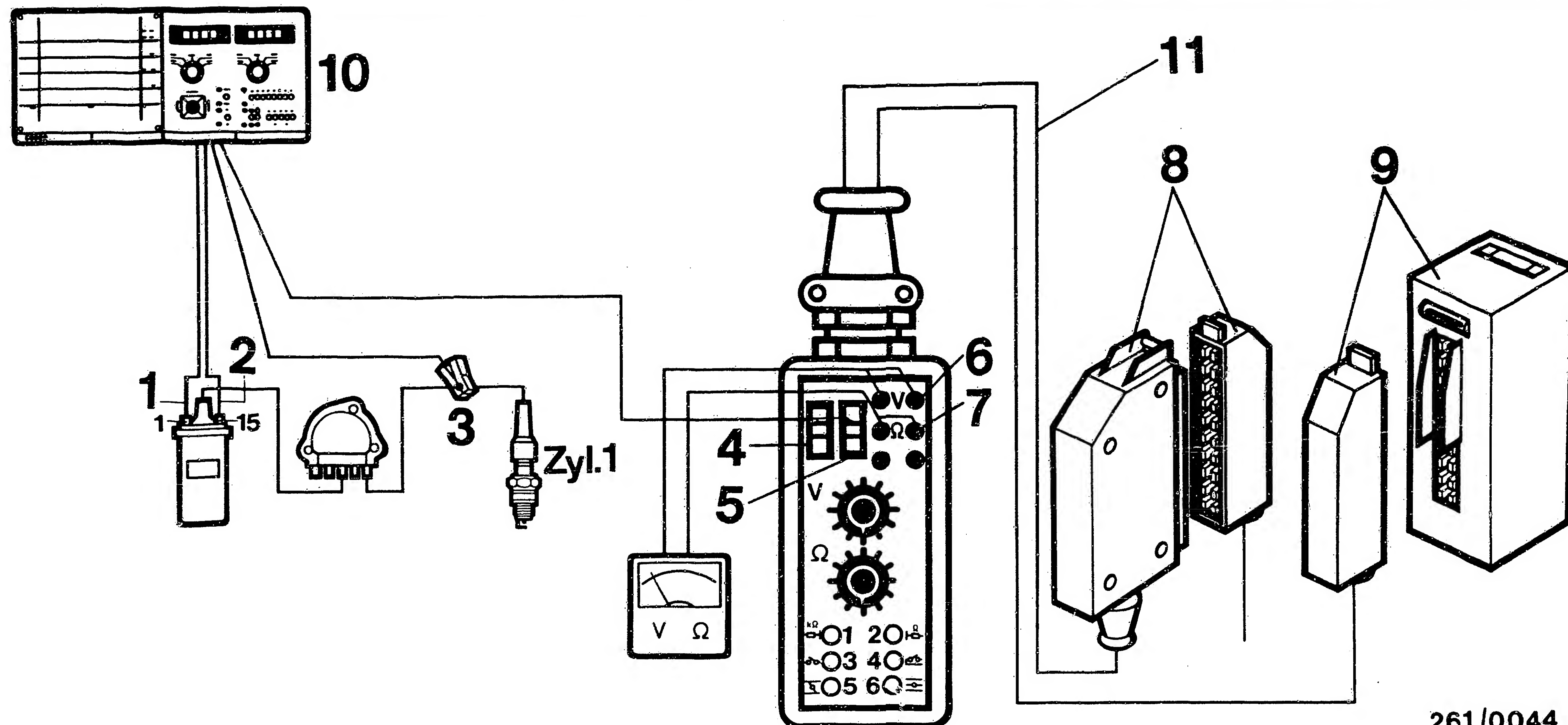




# Universal test adapter with adapter lead

- 1 = Adapter lead (1 684 463 168)
- 1.1 = Connection to wiring harness
- 1.2 = Connection to control unit
- 2 = Universal test adapter  
(0 684 001 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (voltage measurement)
- 5 = Test sockets (resistance measurement)
- 6 = Not used
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Button panel for simulation of  
operating conditions
- Button 1 = NTC II (engine), cold (-20°C)
- Button 2 = NTC II (engine), warm (+80°C)
- Button 3 = Pump energization
- Button 4 = Not used
- Button 5 = Throttle-valve idle contact
- Button 6 = Throttle-valve full-load con.
- 10 = Wiring harness
- 11 = Control unit



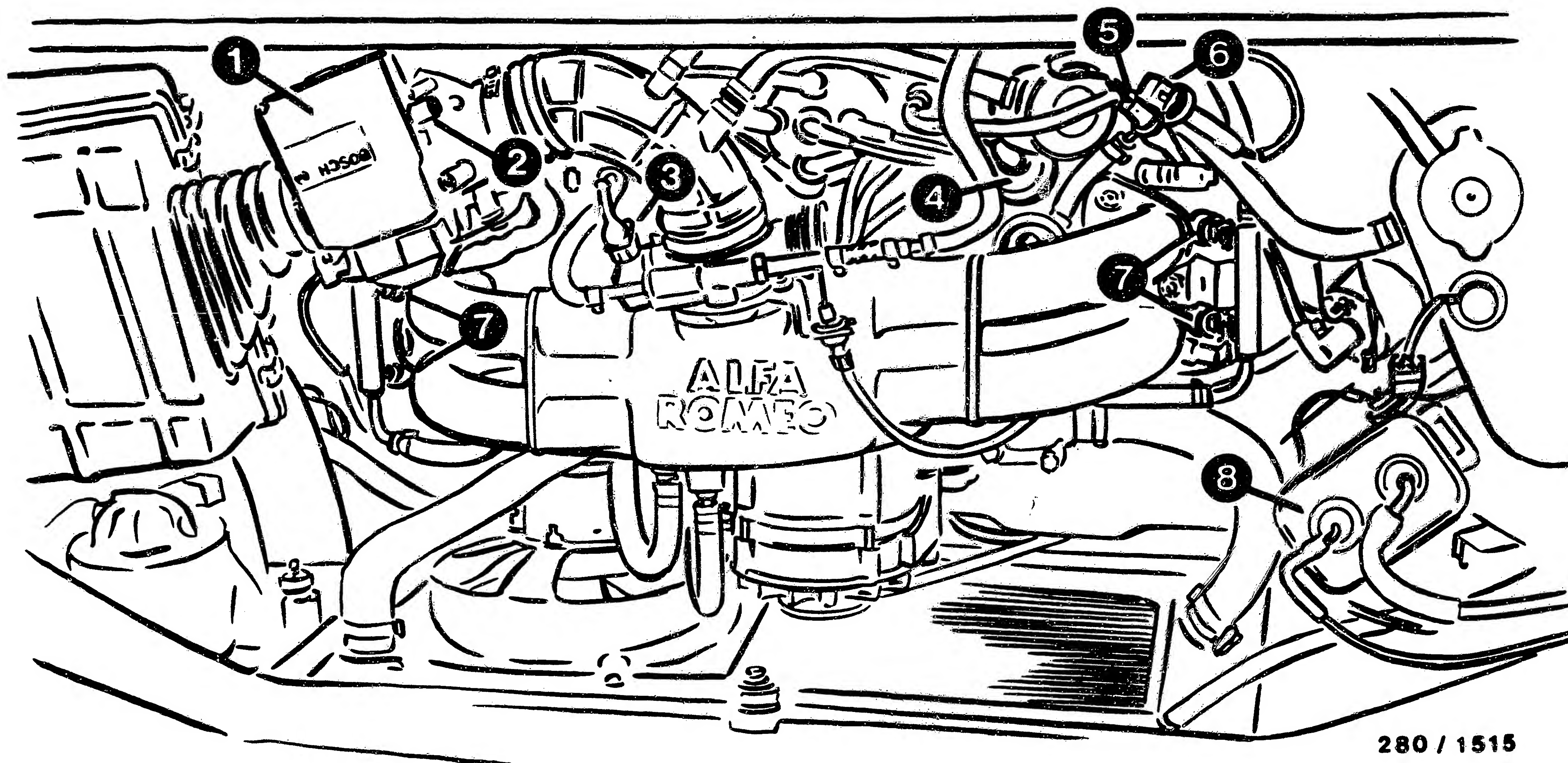
261/0044

- 1 = Green clip to ignition coil term. 1
- 2 = Yellow clip to ignition coil term. 15
- 3 = Induction-type clamp-on pickup over ignition cable of cylinder 1
- 4 = Red connection socket test well for red clamp of motortester
- 5 = Black connection socket (test well) for black clamp of motortester

- 6 = Connection of voltmeter at V sockets (red = +, black = ground/ -)
- 7 = Connection of ohmmeter at  $\Omega$  sockets (blue)
- 8 = Connection to wiring harness
- 9 = Connection to control unit
- 10 = Motortester
- 11 = Adapter lead (1 684 463 168)

TERMINAL DIAGRAM FOR UNIVERSAL TEST ADAPTER





280 / 1515

1 = Measuring and control unit consisting  
of air-flow meter and control unit  
2 = CO adjustment potentiometer  
(lambda closed-loop control)

3 = Throttle-valve switch  
4 = Pressure regulator  
5 = Plug, lambda sensor

6 = Plug, sensor heater  
7 = Solenoid-operated injection valves  
8 = Activated carbon canister

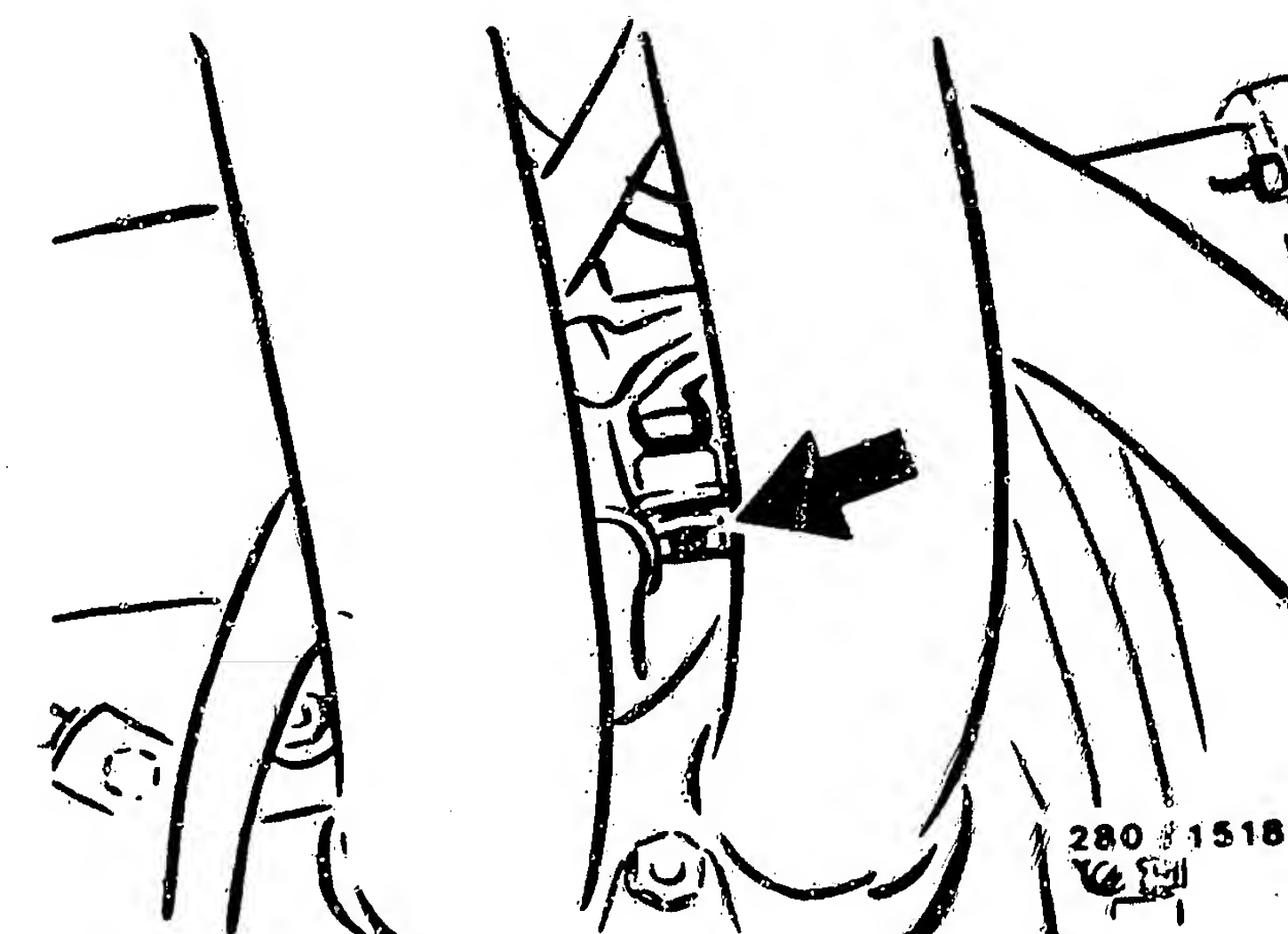
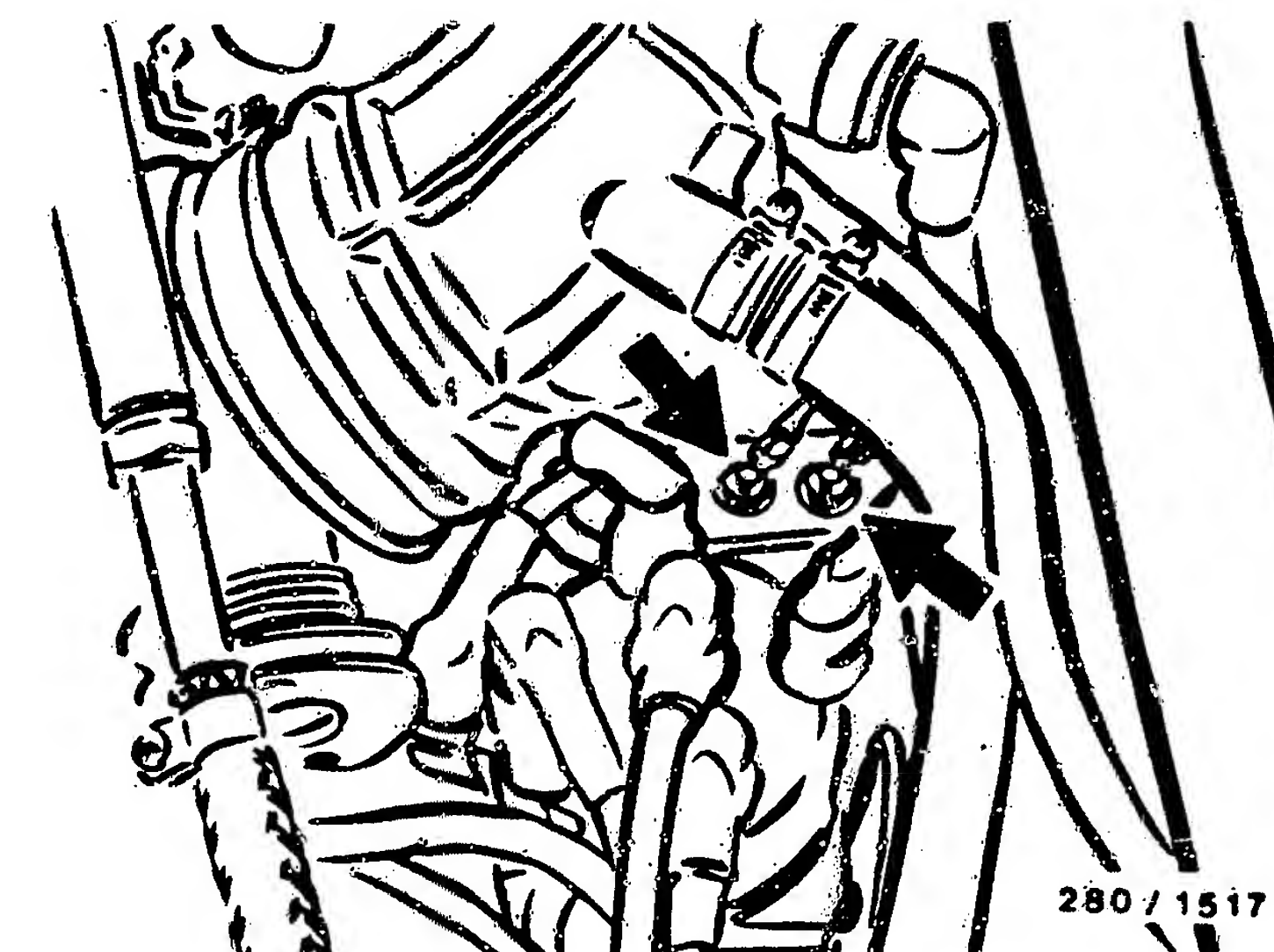
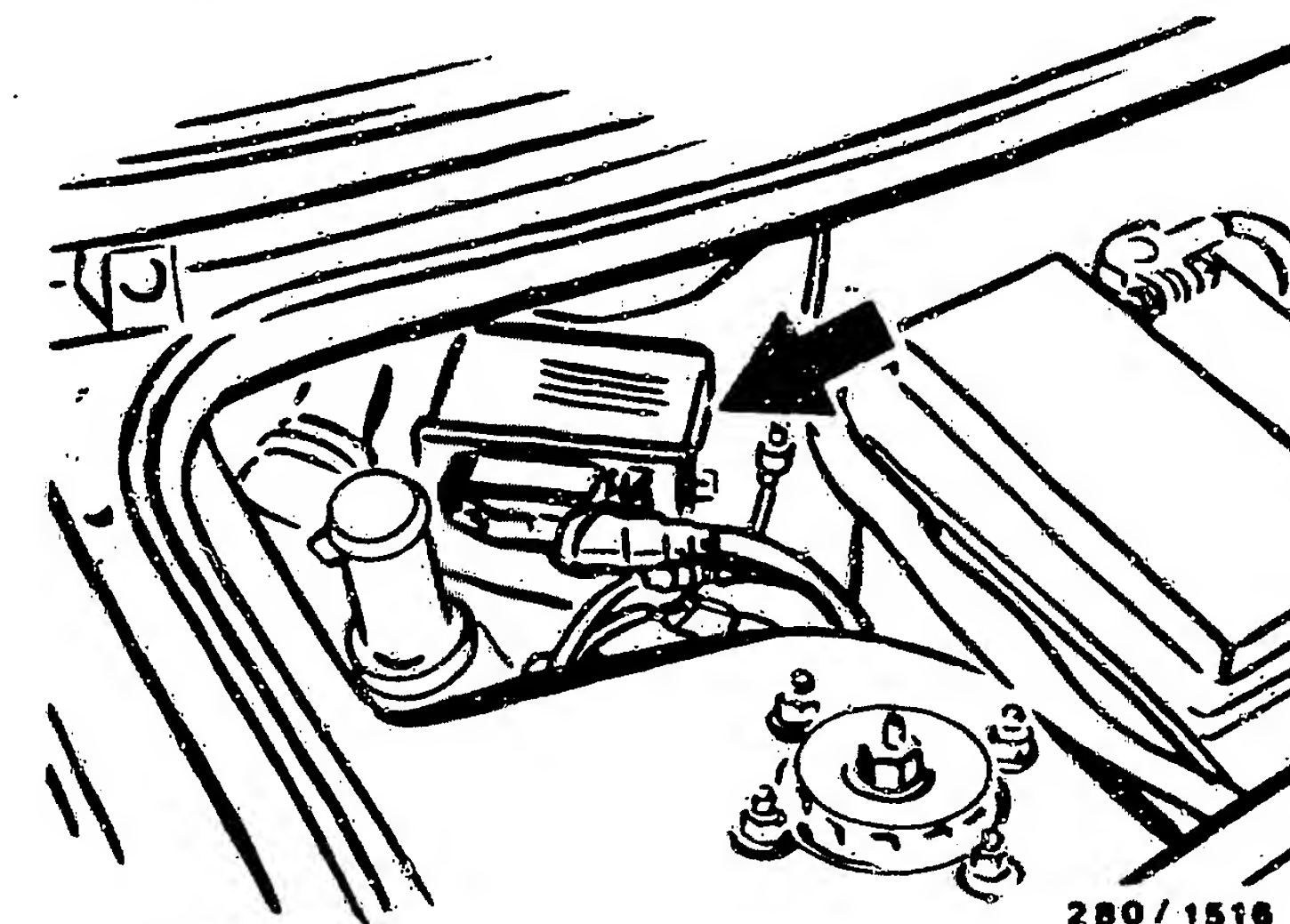
INSTALLATION POSITION OF COMPONENTS



## INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The directions "left" and "right" are always with reference to the forward direction of travel.

- \* Upper illustration  
Arrow = Ignition control unit
- \* Center illustration  
Arrow = Central ground
- \* Lower illustration  
Arrow = Temperature sensor (engine)  
On the right-hand side between the intake-manifold passages.



# INSTALLATION POSITION OF COMPONENTS (CONTINUED)

\* Upper illustration  
 Arrow = Electric fuel pump  
 At the vehicle floor behind the left-hand McPherson strut.

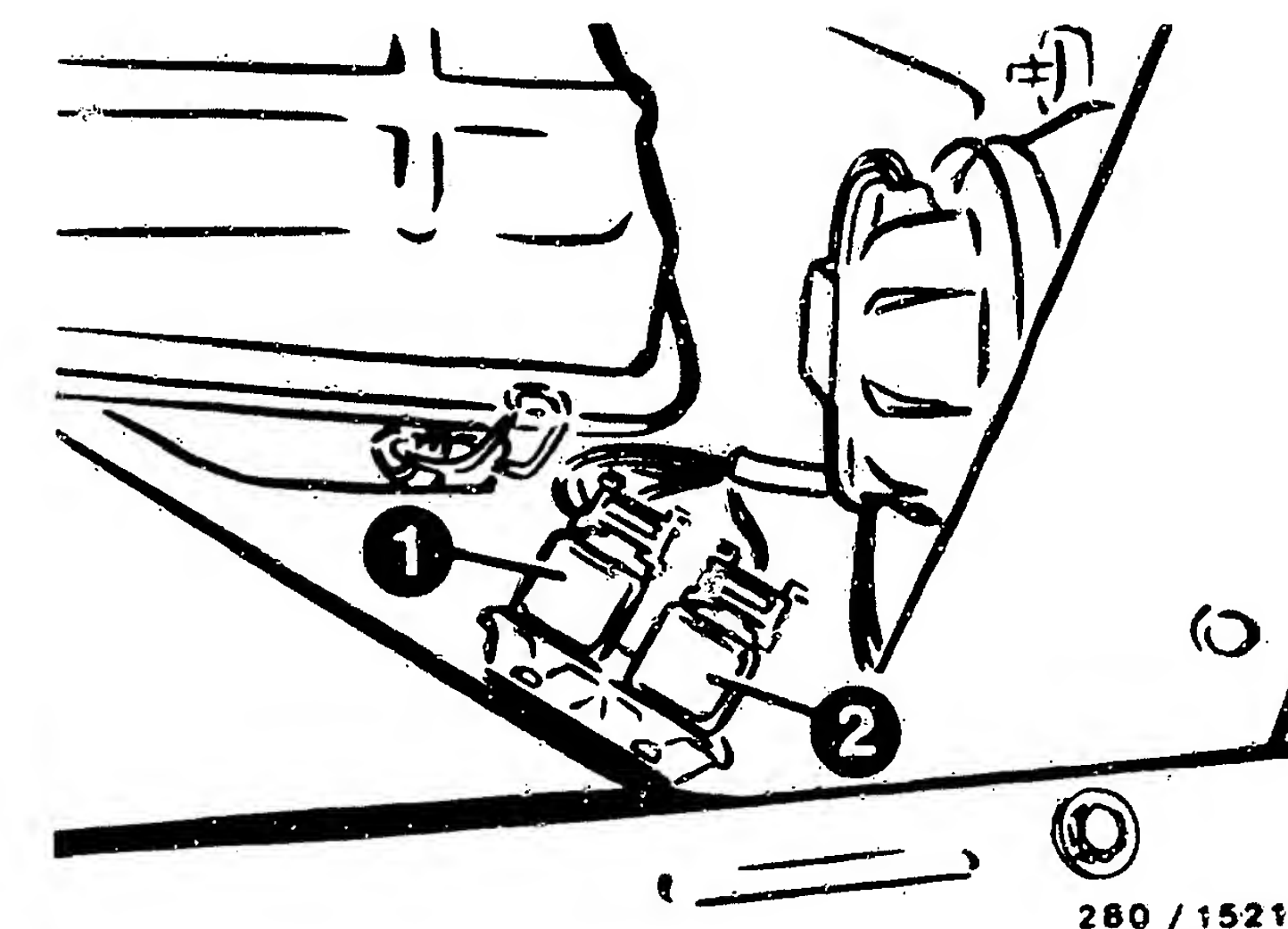
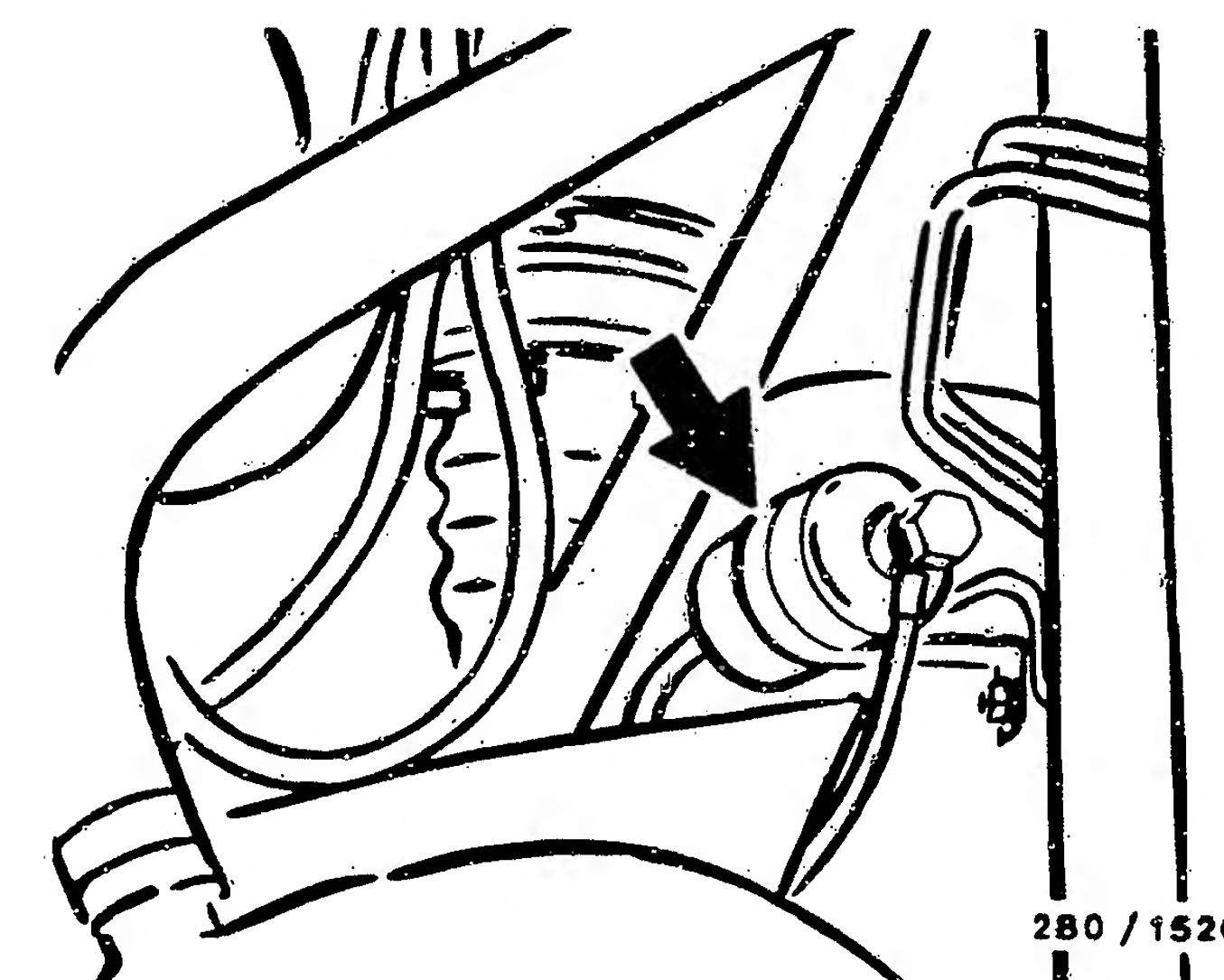
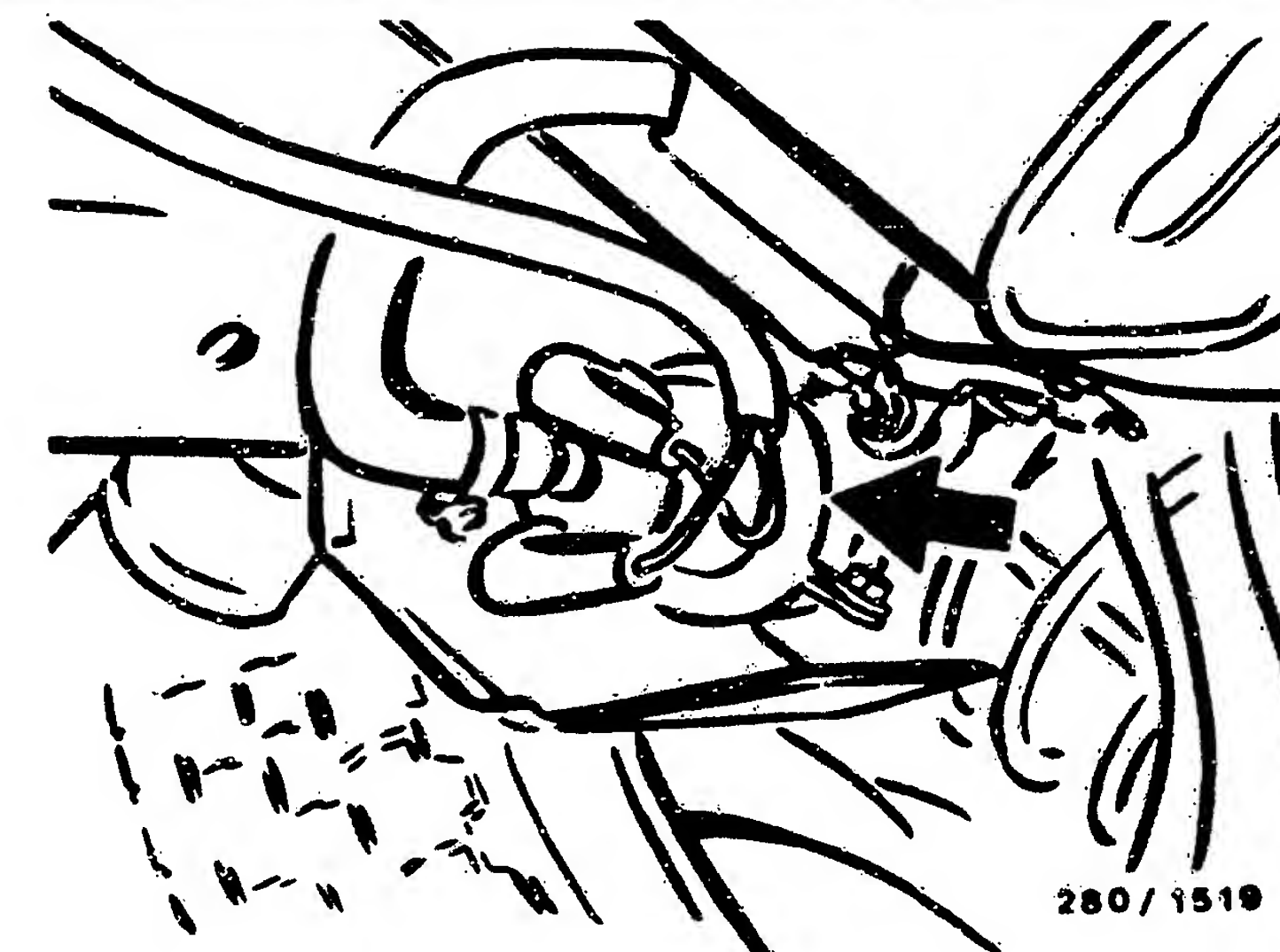
\* Center illustration  
 Arrow = Fuel filter

\* Lower illustration  
 1 = Main relay  
 2 = Pump relay  
 Both relays are located beneath a protective cover.

\* Heated lambda sensor:  
 In the exhaust pipe before the catalytic converter.

\* Auxiliary-air device:  
 On the right-hand side behind the intake-manifold passages.

\* Tank-ventilation valve (driven by vacuum):  
 Beneath the activated carbon canister.





Separate measuring and control unit

Removal and mounting of the control unit from the air-flow sensor is necessary only for the following operations:

- \* Electrical test of air-flow sensor (potentiometer and temperature sensor (intake-air)).
- \* Replacement of air-flow sensor
- \* Replacement of control unit

Removal of control unit:

Unlatch 15-pin plug and remove.

Remove measuring and control unit from air-filter housing and loosen air-guide hose.

When removed, clean measuring and control unit, particularly area of plug, joint and screw-on points.

Use a clean cloth and benzine, if necessary.

Dry only with hot air! Compressed air is not allowable.

Avoid excessive jolting when handling.

Lever out anti-tamper cap of connecting screw.

Unscrew 4 connecting screws.

Remove control unit vertically upward, without tools.

Caution: do not tilt, do not damage sealing edges.

Do not soil interior of control unit or air-flow sensor, and be sure to avoid pressure on protective cover.

Mounting of control unit:

Replace defective component, air-flow sensor or control unit.

Clean sealing groove on control unit and press in new steel ring, correctly positioned. Do not turn seal ring.

Clean seating surface on air-flow sensor.

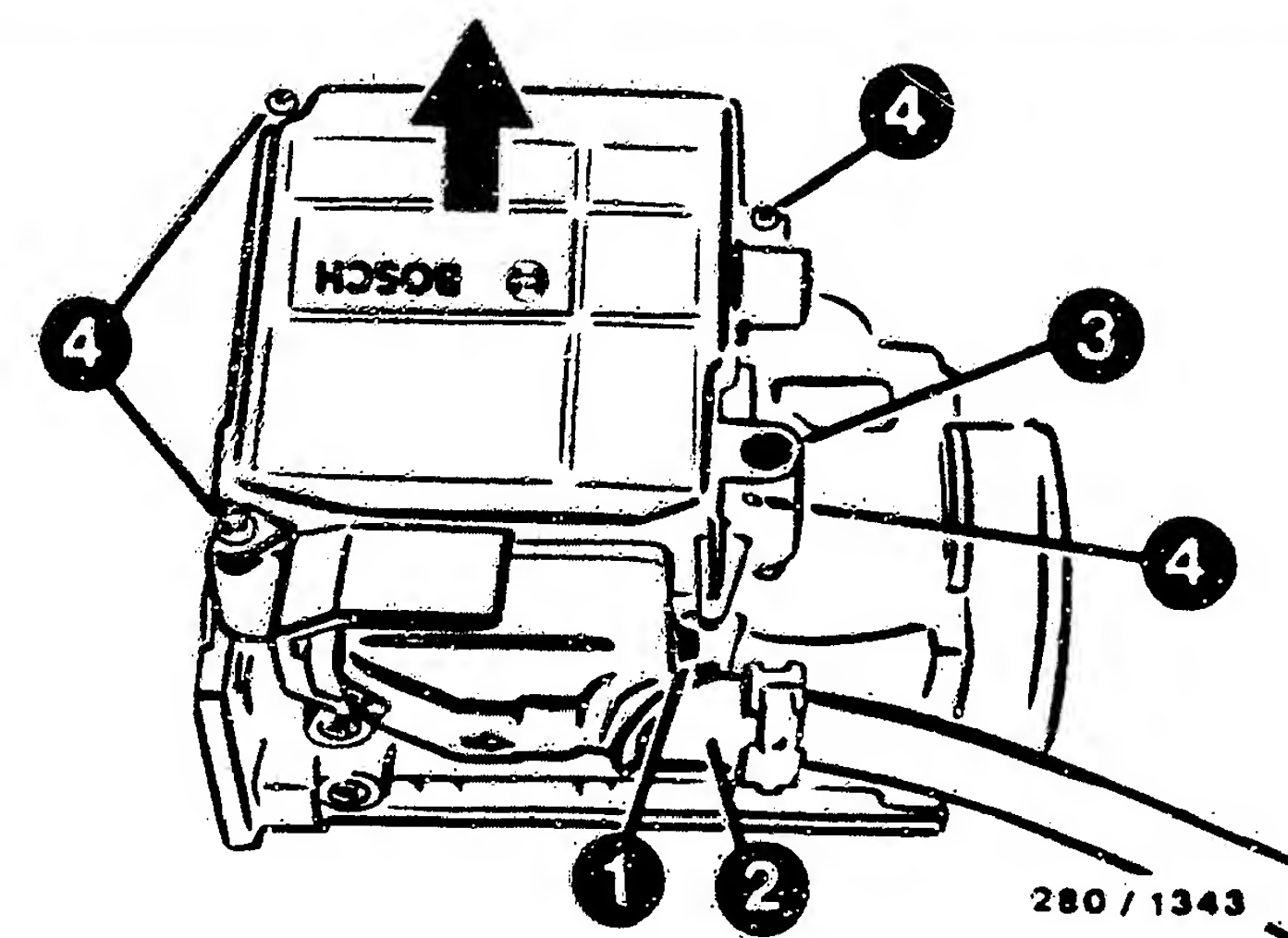
Place control unit on air-flow sensor and press in parallel.

Wet threads of 4 connecting screws with locking paint and screw in. Tighten cross-wise to 1.0...1.4 Nm torque. Press anti-tamper cap No. 1 280 508 004 onto connecting screw.

Screw measuring and control unit onto air-filter housing and mount air-guide hose.

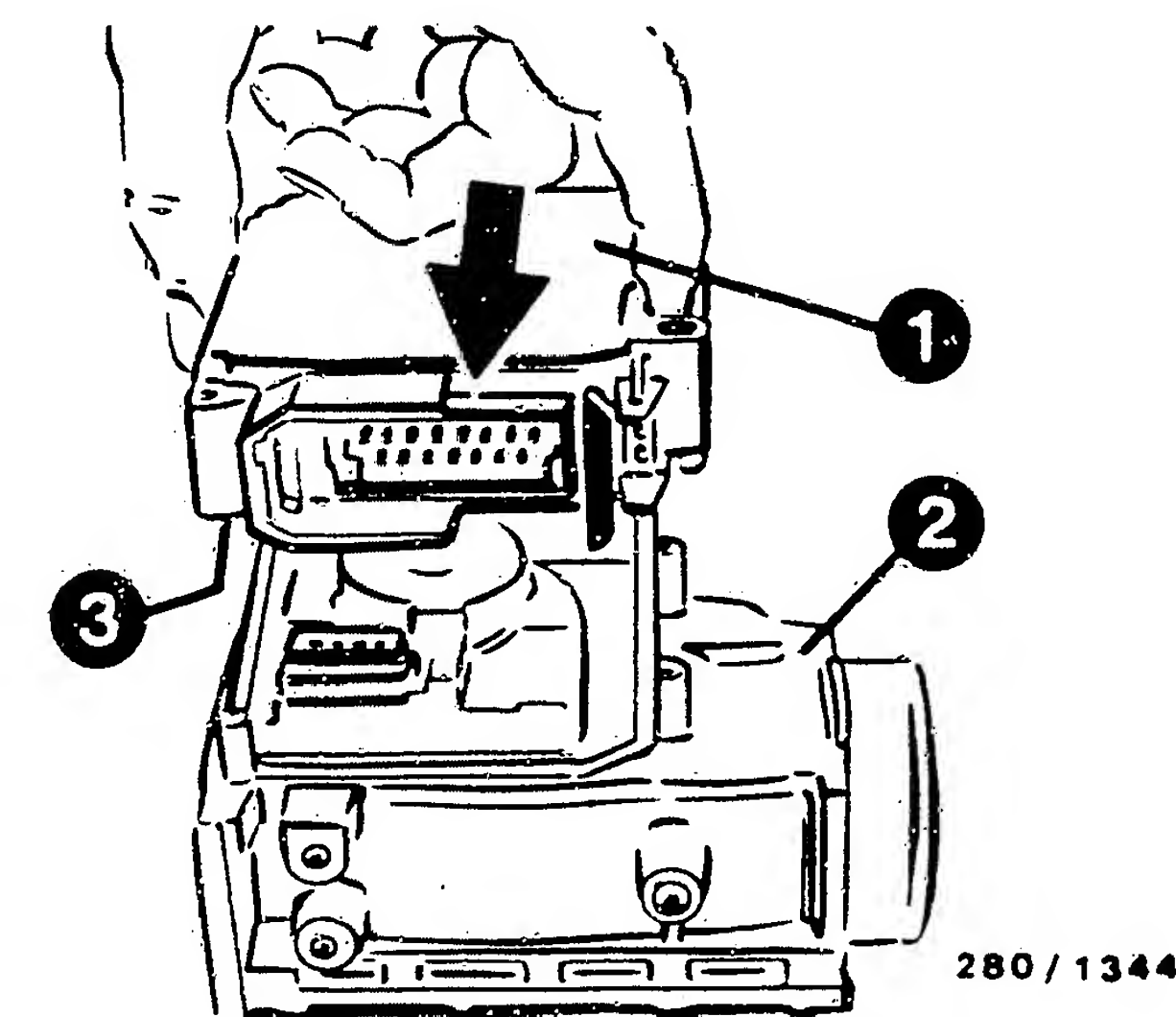
Connect 15-pin plug and latch in.

After installing a new air-flow sensor or control unit, perform idle adjustment. See Coordinate D25.

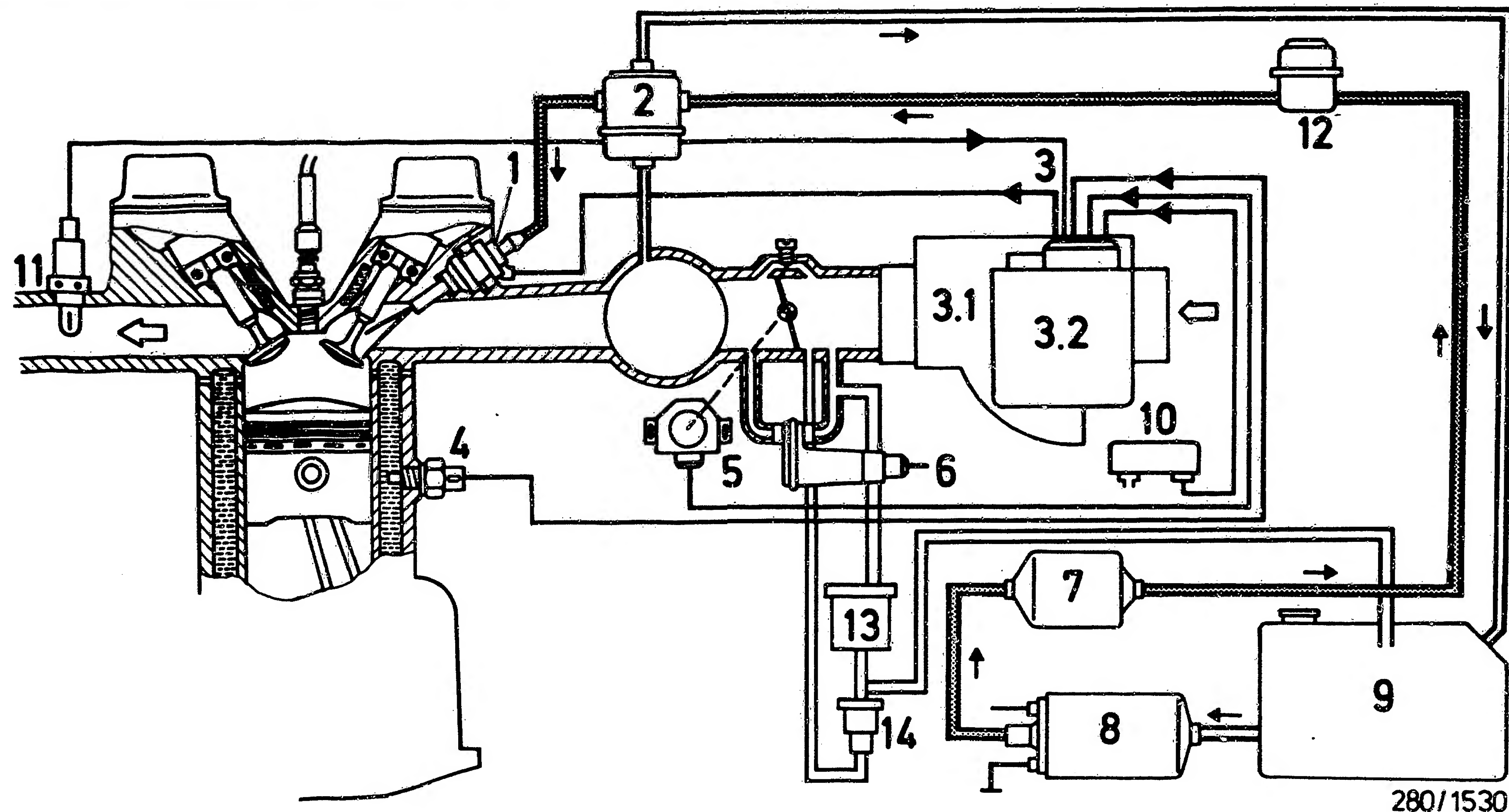


- 1=Latching spring
- 2=15-pin plug
- 3=Anti-tamper cap
- 4=Connecting screws
- Arrow =Pull off control unit vertically

- 1=Control unit
- 2=Air-flow sensor
- 3=Seal ring
- Arrow =Press on control unit vertically, parallel







- 1 = Solenoid-operated injection valve
- 2 = Pressure regulator
- 3 = Measurement and control facility
- 3.1 = Air-flow sensor
- 3.2 = Control unit
- 4 = Temperature sensor, engine

- 5 = Throttle-valve switch
- 6 = Auxiliary-air device
- 7 = Fuel filter
- 8 = Electric fuel pump
- 9 = Fuel tank
- 10 = Pressure sensor (altitude sensor)

- 11 = Lambda sensor
- 12 = Fuel-pressure damper
- Tank ventilation system
- 13 = Active-carbon container
- 14 = Tank ventilation valve

||||| = Fuel pressure  
 — = Pressureless

When performing trouble-shooting, consideration is to be given to the fact that additional systems/components such as brake booster, centralized locking system or vacuum headlight vertical-aim control may be connected to the intake manifold and may thus represent additional sources of error.

DIAGRAM OF AIR AND FUEL LINES

## HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts on coordinate B03 and contains customer complaints (fault symptoms) with several possible causes (component faults) in each case as well as coordinate references for detailed trouble-shooting. If no coordinate reference is given, this is a cause for which no test instructions are required.

Components that are checked by the self-diagnosis or with the universal test adapter are not listed in the trouble-shooting chart.

If the customer complaint is clear, proceed with trouble-shooting in the given order of possible causes one after the other and step by step.

Always start trouble-shooting with the self-diagnosis (if applicable) or with the universal test adapter (if provided). Only then continue with the trouble-shooting chart.

If the customer complaint is not clear, check all the causes listed in the trouble-shooting chart. To prevent possible incorrect measurements, check all causes in the order given (owing to the interlinking of test steps).

## HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (continued)

The TROUBLE-SHOOTING PROGRAM contains all system and component checks mentioned in the trouble-shooting chart. It is divided into three rows of boxes.

The left-hand column contains test instructions and set values.  
The center column contains instructions on trouble-shooting and fault rectification.  
The right-hand column contains the illustrations/terminal diagrams belonging to the text, with explanations.

If the questions in the left-hand column can be answered conclusively with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there.  
After rectifying a fault repeat the test as a check.

### REQUIREMENTS FOR TESTING:

- Battery fully charged
- Engine in good mechanical condition (e.g. compression, valve clearance etc.)
- Engine at operating temperature, approx. +80°C (where necessary)
- Proper seating of all plug connections of wiring harness
- Ignition system O.K.



## TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

										Cause (component fault)	Coord.
*	*	*	*	*	*	*			*	Universal test adapter	A09
*	*	*	*		*					Air intake system	C19
*	*	*	*							Auxiliary-air device	C21
*		*	*	*	*	*				Air-flow sensor	C23
				*	*					Fuel delivery	D01
*	*	*	*		*	*	*			Fuel pressure, leakage	D03
		*								Pump noise	D11
		*		*	*	*	*			Sol.-op. injection valves	D13
				*						Alternator, int. supp.	D15
*	*	*				*				Start control	D19
				*		*				Overrun cutoff	D21
		*	*	*		*				Engine-speed, CO adjustment	D25
		*	*	*		*				Lambda closed-loop control	D27
					*					Exhaust-gas catalytic conv.	E03
	*	*	*			*				Tank ventilation system	E05

## HOW TO USE THE TEST CHART FOR THE UNIVERSAL TEST ADAPTER

- \* Before testing, check all multiple plug-in connections for loose contacts.
- \* Clean plug-in contacts if dirty or corroded.
- \* Check for blade receptacles that have been pushed back. If necessary, bend back locking lug and press receptacle as far as it will go into plug housing; locking lug latches.
- \* Suspicion of line breaks (positive and negative leads) in case of kinking and pinching.

**Connect adapter lead.**

The tests cover the peripherals and, where applicable, also the control unit. To take readings, connect to the universal test adapter a multimeter for voltage and resistance measurements and/or a motortester. The test must always be performed completely, starting at test step 1, in the order given.

**TEST PROCEDURE:**

1. The individual test steps build on one another.  
Example: If, in one test step, the ground connection for the control unit is tested, this test is not repeated again in the further test steps.
2. If, in one test step, the set value is not obtained, this test step must be repeated after the fault has been rectified.

**Note:**

In the following test steps, the passages with an additional frame around them show which operation has to be changed compared with the preceeding test step.



Component/function:

Only connect control-unit plug.

Engine temperature sensor, leads/resistance.

N>

\* Operation:

Position

Prog. switch "V"

⇒

Prog. switch " Ω "

5

Test button

—

\* Measuring equipment

Motortester or multimeter

\* Measuring range:

approx. 5k Ω or 500 Ω

\* Connection:

Test sockets, ohms, blue

\* Trigger function on vehicle:

Not applicable

\* Set value:

At ambient temperature

+15°...+30°C:

1.45...3.3 k Ω

With engine at operating temp.

approx. +80° C:

280...360 Ω

Is measured value within

set-value tolerance?

Y

V

Continued on next picture page

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter.

Measure resistance directly at temperature sensor (engine).

Ambient temperature

+15°...30°C

Set value: 1.45...3.3 k Ω

with engine at operating temp.

approx. +80°C

Set value: 280...360 Ω

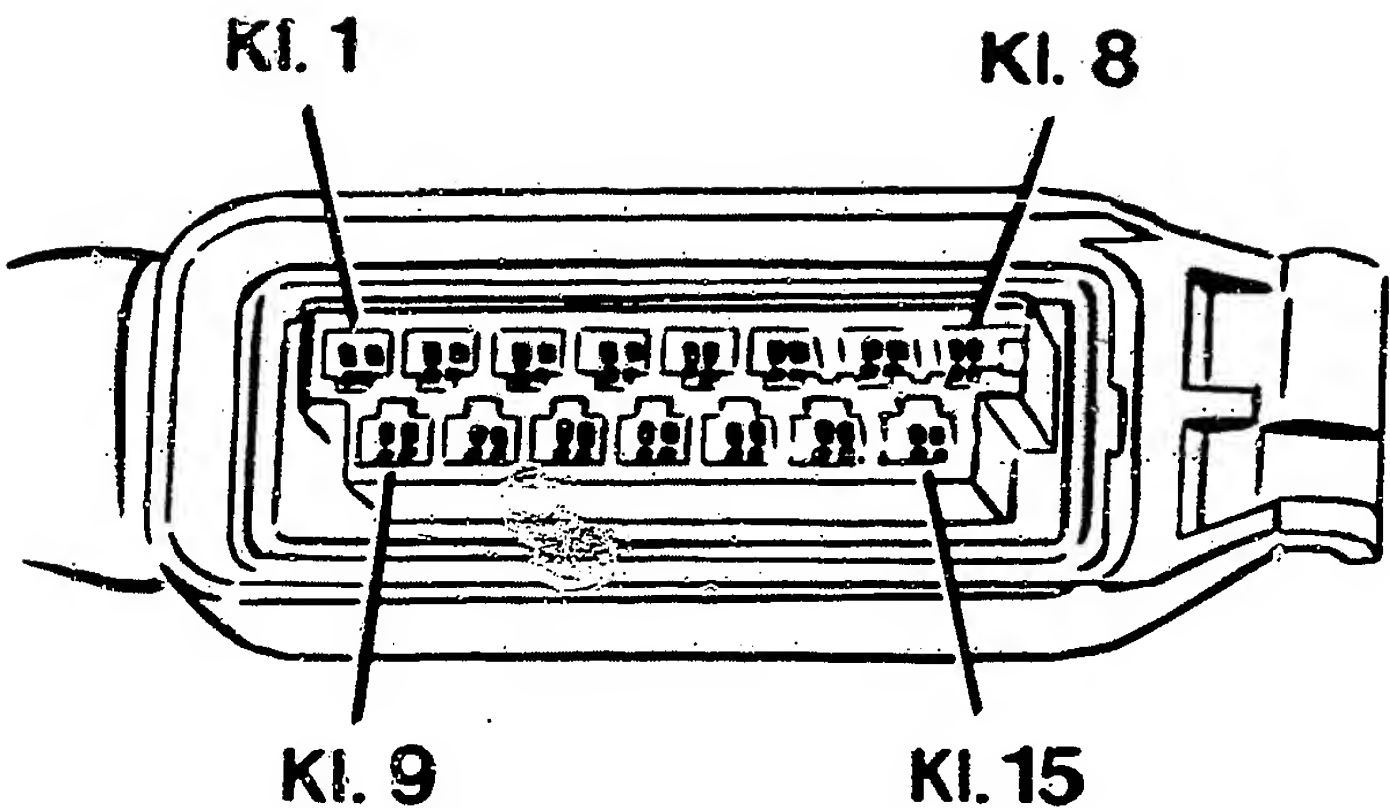
If set set values are not obtained => replace temperature sensor.

Check the following leads for continuity with ohmmeter, set value approx. 0 Ω :

\* From control-unit plug term. 8 to temperature sensor (engine)

\* From control-unit plut term. 5 to temperature sensor (engine)

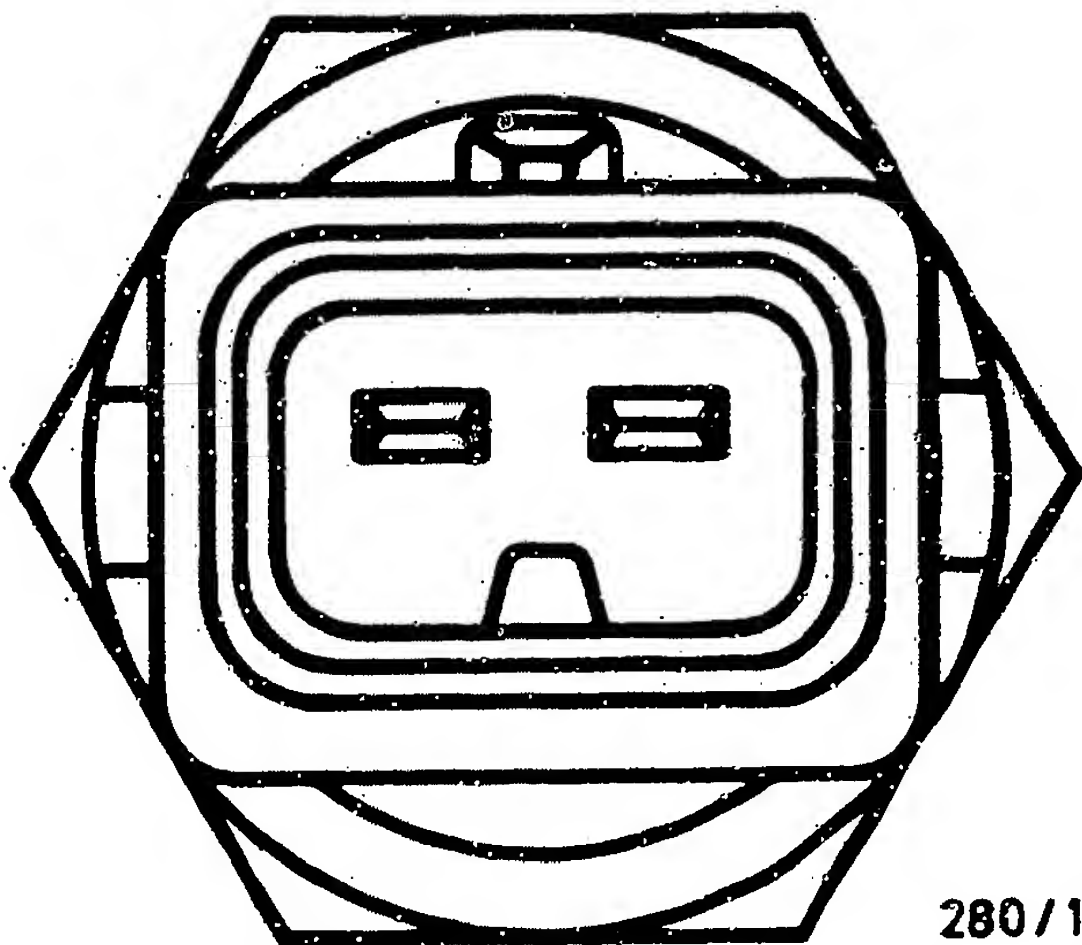
Eliminate open circuits/contact resistances.



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Top view of control-unit plug

Top view of connector of engine-temperature sensor



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Component/function:

Ground connection of output stage.

N&gt;

* Operation:	Position
Progr. switch "V"	==>
Progr. switch "Ω"	6
Test button	—

\* Measuring equipment  
Motortester or multimeter

\* Measuring range:  
x 10 Ω

\* Connection:  
Blue test sockets, ohm

\* Operation in vehicle:  
Not applicable

\* Set value:  
0...10 Ω

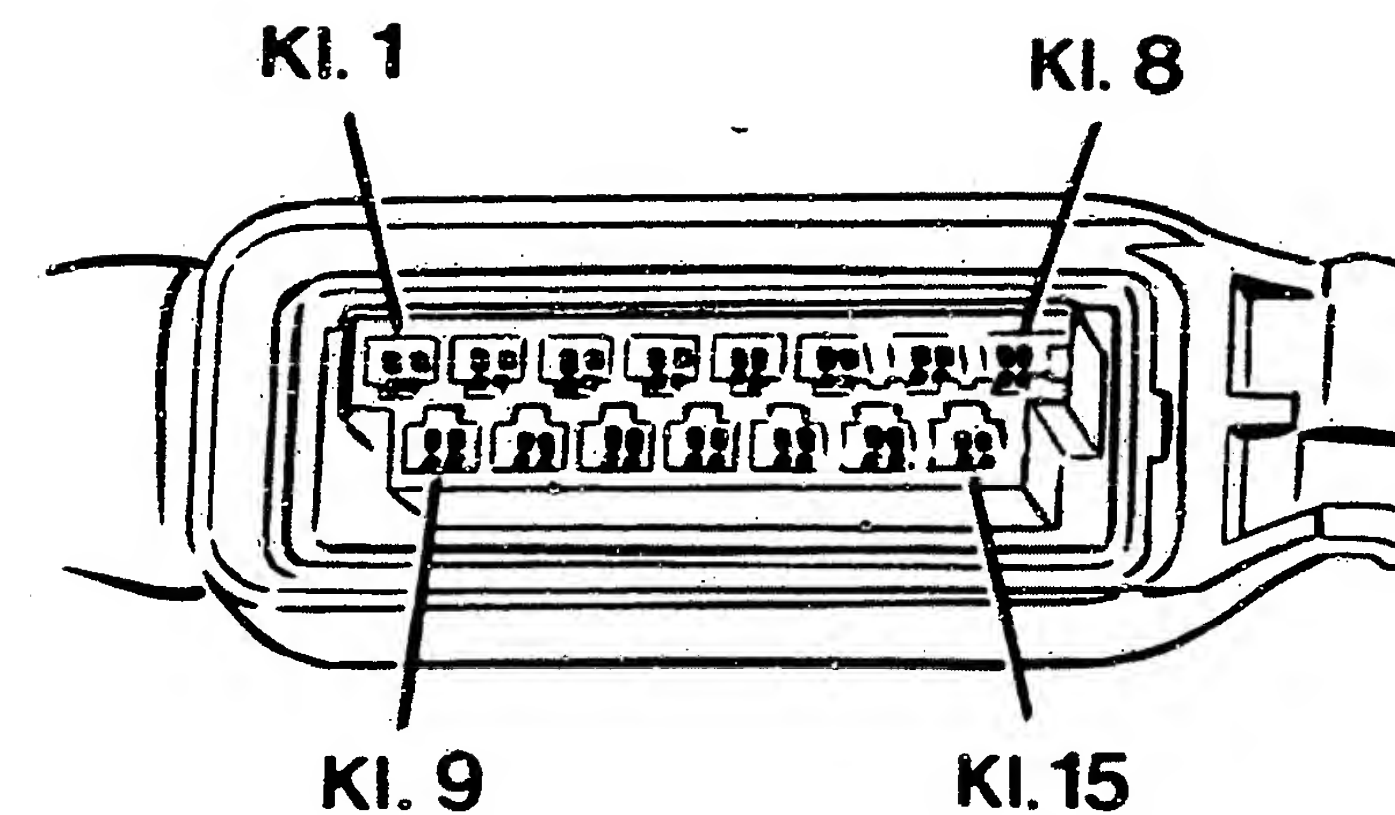
Is measured value within  
set-value tolerance?

Trouble-shooting:

For testing, disconnect control-unit plug.

Check the following leads  
for continuity with ohmmeter,  
set value approx. 0 Ω :

- \* From control-unit plug  
term. 4 to vehicle ground.
- \* From control-unit plug  
term. 5 to vehicle ground.  
Eliminate open circuits/  
contact resistances.



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Top view of control-unit plug

Continued on next picture page

Component/function:

Connection of t v coding of  
lambda closed-loop control.

* Operation:	Position
Prog. switch "V"	=>
Prog. switch "Ω"	7
Test button	—

N&gt;

\* Measuring equipment  
Motortester or multimeter

\* Measuring range:  
x 10 Ω

\* Connection:  
Test sockets, ohms, blue

\* Trigger function on vehicle:  
End of lead from term. 6  
to ground.

\* Set value:  
0...10 Ω

Is measured value within  
set-value tolerance?

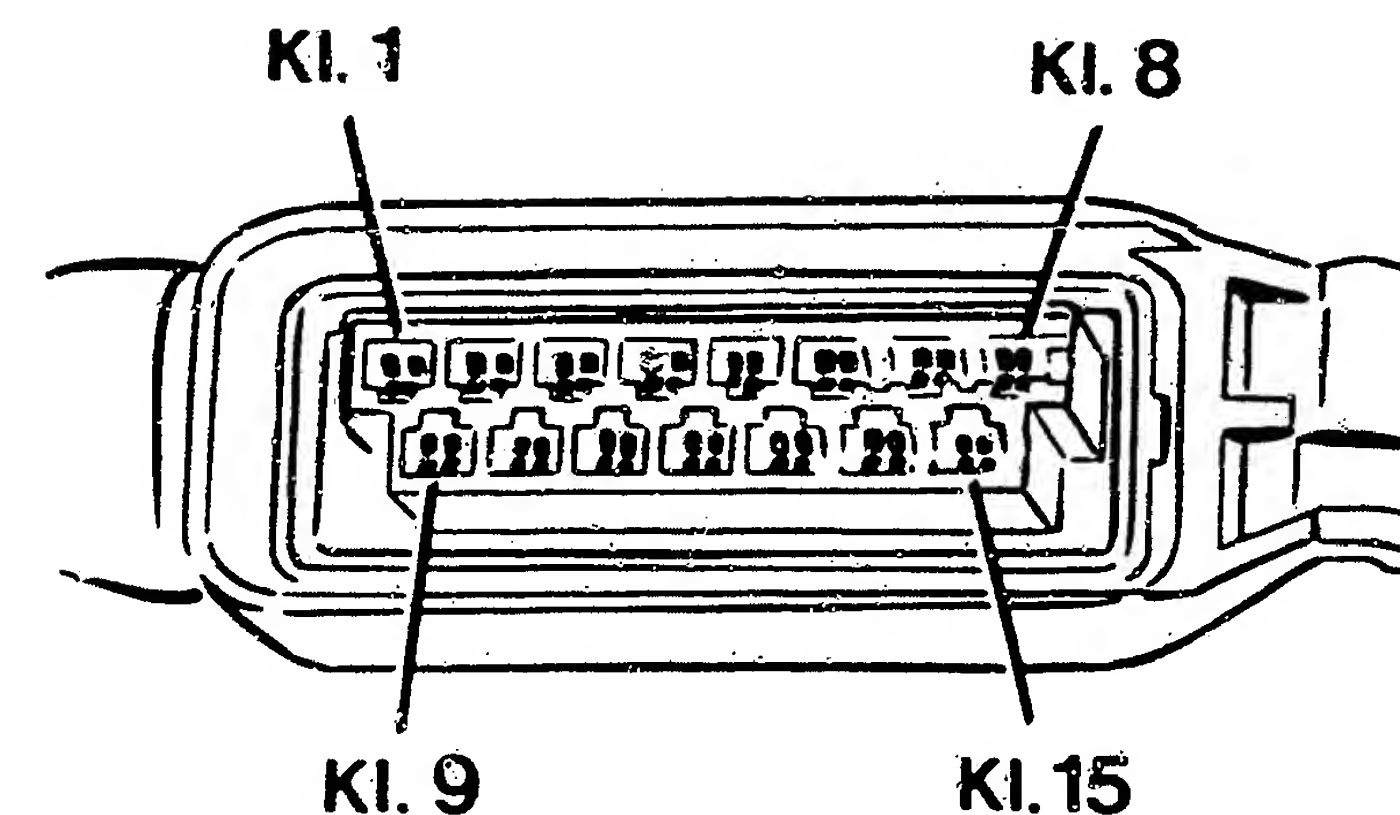
Trouble-shooting:

For testing, disconnect  
control-unit plug.

Check the following lead  
for continuity with ohmmeter,  
set value approx. 0 Ω :

From control-unit plug  
term. 6 to end of lead.

Eliminate open circuits/  
contact resistances.



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Top view of control-unit plug

Continued on next picture page



Component/function:

Throttle-valve switch, leads/  
resistance of idle contact,  
adjustment.

* Operation:	Position
Prog. switch "V"	==>
Prog. switch "Ω"	9
Test button	—

N&gt;

\* Measuring equipment  
Motortester or multimeter

\* Measuring range:  
x 10 Ω

\* Connection:  
Test sockets, ohms, blue

\* Trigger function on vehicle:  
Accelerator pedal not depressed

\* Set value:  
0...10 Ω

\* Trigger function on vehicle:  
Depress acc. pedal somewhat

\* Set value:  
infinity Ω

Is measured value within  
set-value tolerance?

Y

V

Continued on next picture page

Trouble-shooting:

Requirement: throttle valve is  
correctly adjusted.

It must come up against the  
adjusting screw with the lever  
just before it sticks.

Secure against turning.

- \* Adjust throttle cable/linkage  
so that it is free of tension.
- \* If kinked => replace.

For testing, disconnect  
control-unit plug from test  
adapter.

Adjustment of throttle-valve  
switch

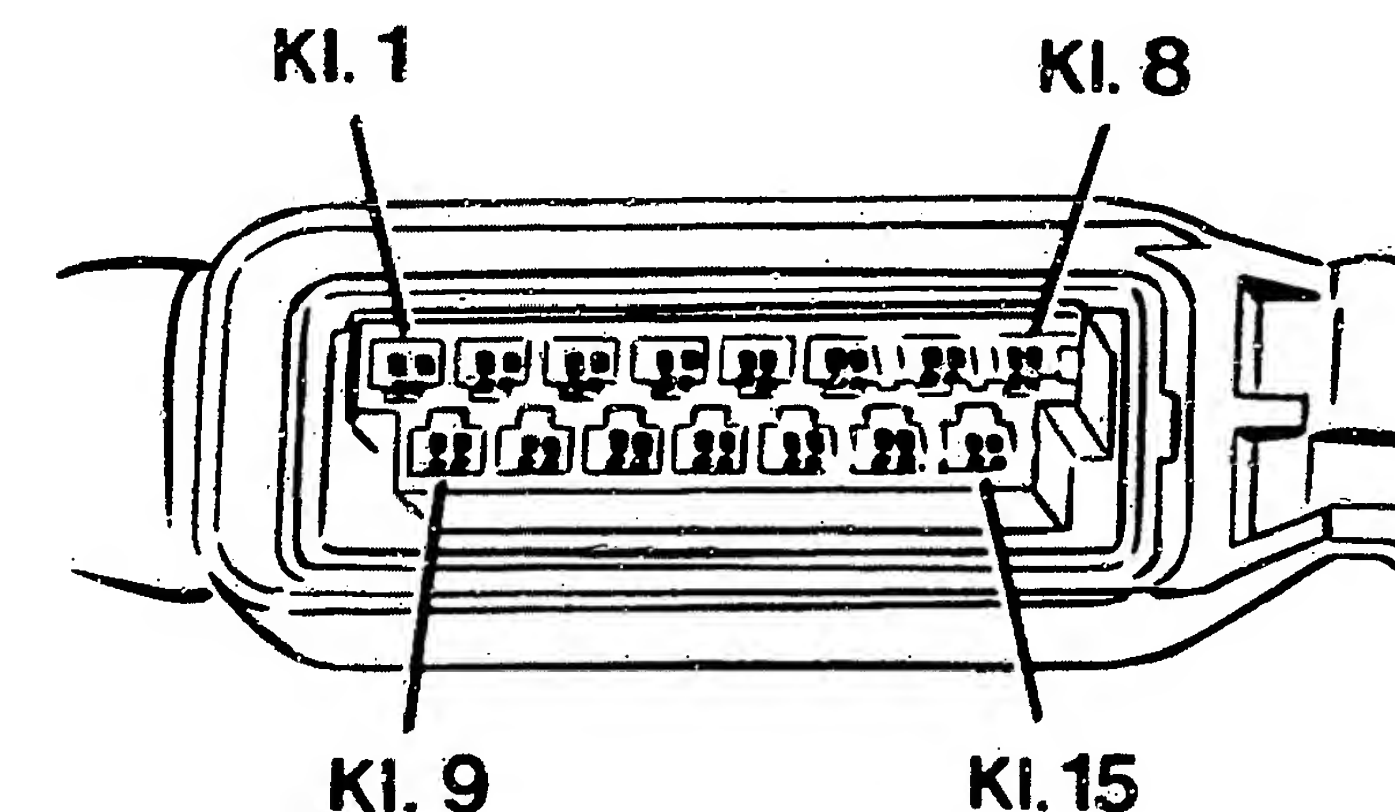
Loosen fastening screws  
slightly. Connect ohmmeter  
to throttle-valve switch  
between term. 2 and term. 18.

Turn throttle-valve switch  
until the idle contact closes  
(microswitch clicks audibly).  
Reading 0 Ω. If not =>  
replace throttle-valve switch.

Checking the adjustment:  
Pull slightly on throttle  
cable. The idle contact opens  
(microswitch clicks audibly).  
Reading: infinity Ω.

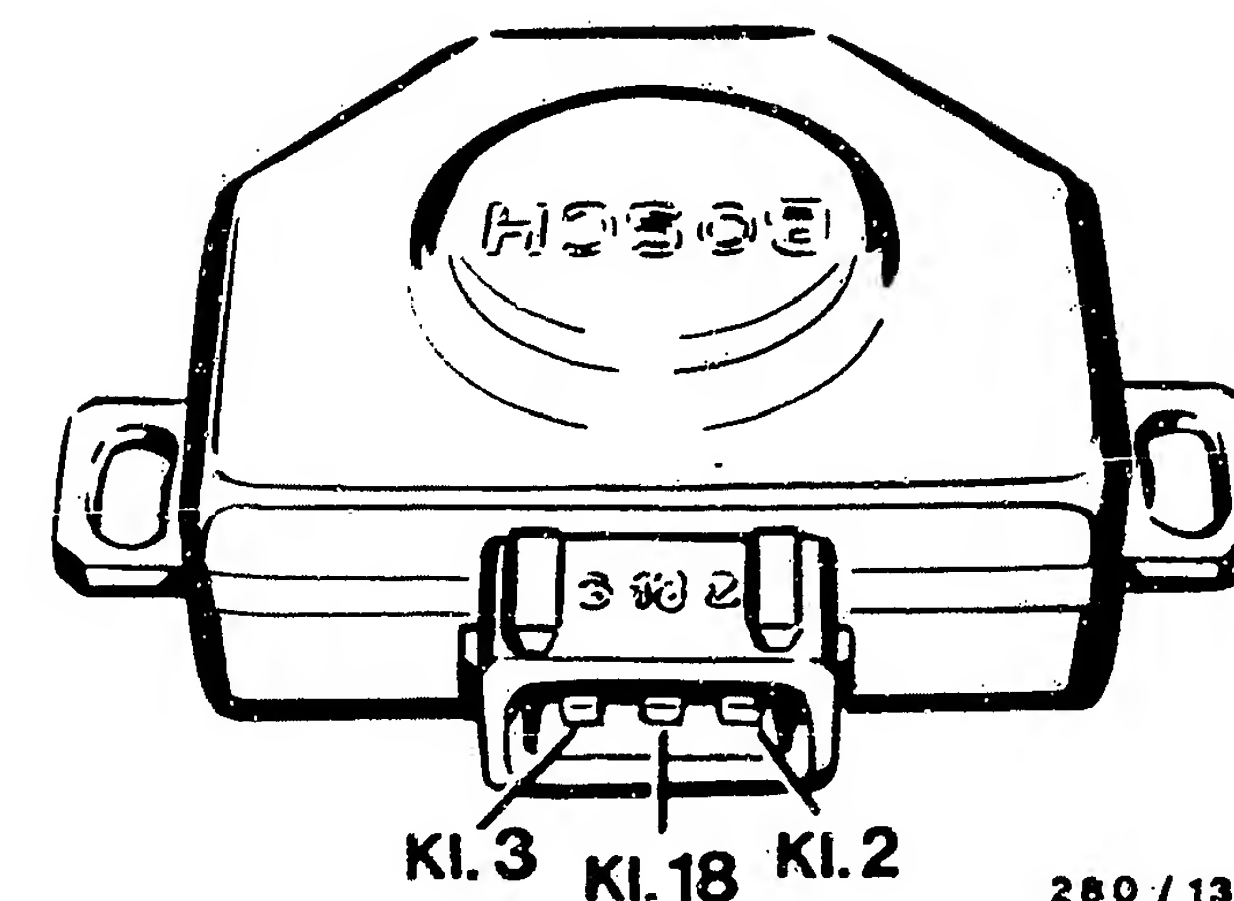
Check the following leads for  
continuity with ohmmeter,  
set value approx 0 Ω :

- \* From throttle-valve switch  
term. 2 to control-unit  
plug term. 15
- \* From throttle-valve switch  
term. 18 to vehicle ground.  
Eliminate open circuits/  
contact resistances.



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Top view of control-unit plug



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Component/function:

Throttle-valve switch, leads/  
resistance of full-load  
contact.

* Operation:	Position
Prog. switch "V"	⇒
Prog. switch "Ω"	■
Test button	—

\* Measuring equipment  
Motortester or multimeter

\* Measuring range:  
x 10 Ω

\* Connection:  
Test sockets, ohms, blue

\* Trigger function on vehicle:  
Accelerator pedal not depressed

\* Set value (indication):  
infinity Ω

\* Trigger function on vehicle:  
Completely depress acc. pedal

\* Set value (indication):  
0 - 10 Ω

Is measured value within  
set-value tolerance?

N&gt;

Trouble-shooting:

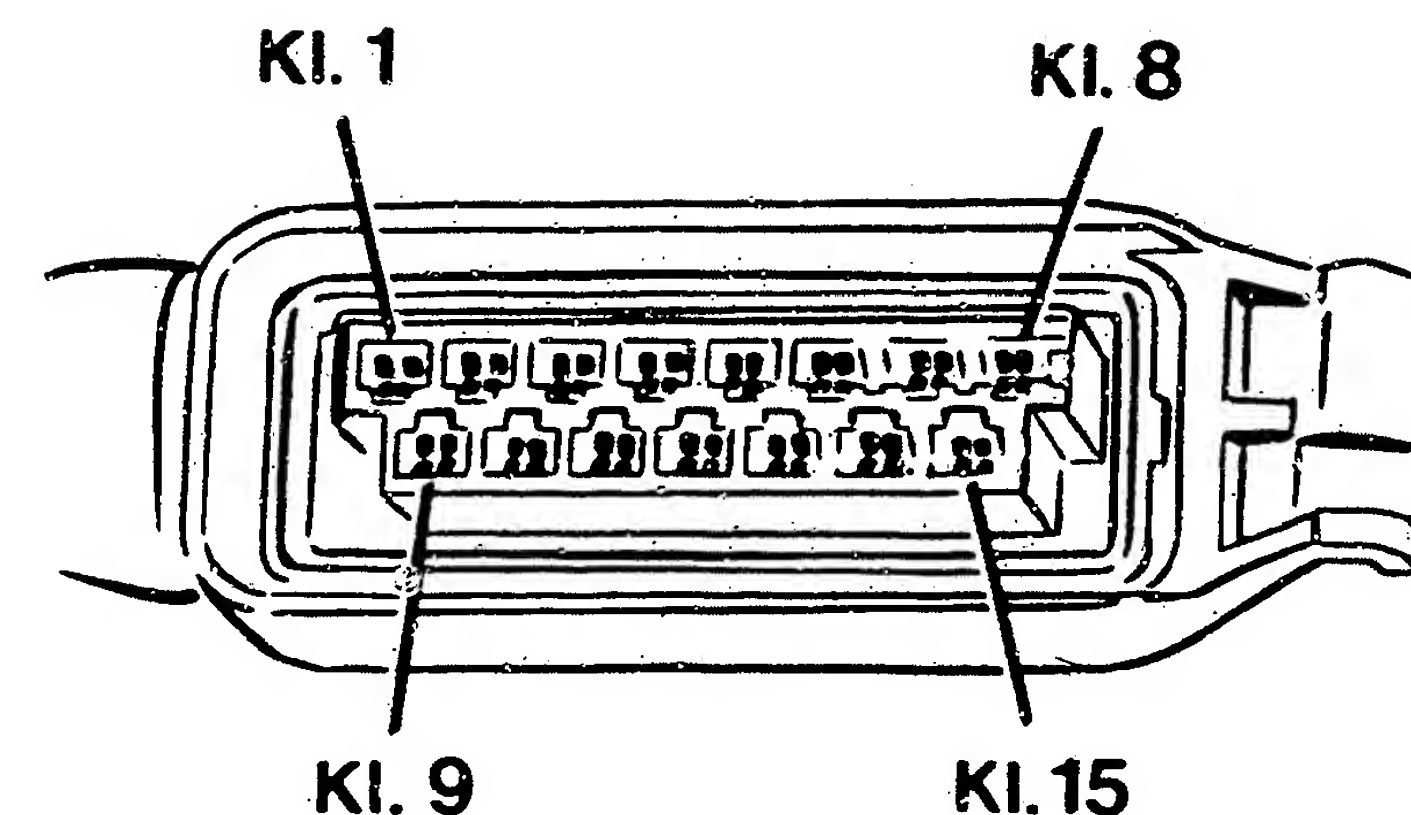
For test purposes, detach  
control-unit plug from  
test adapter.

Measure resistance directly  
at throttle-valve switch  
at term. 3 and term. 18.  
Accelerator pedal not depressed  
Set value: infinity Ω  
Fully depress accelerator pedal.  
Set value: approx. 0 Ω  
If set values are not  
attained => renew throttle-  
valve switch.

Use ohmmeter to test following  
leads for continuity,  
Set value approx 0 Ω :

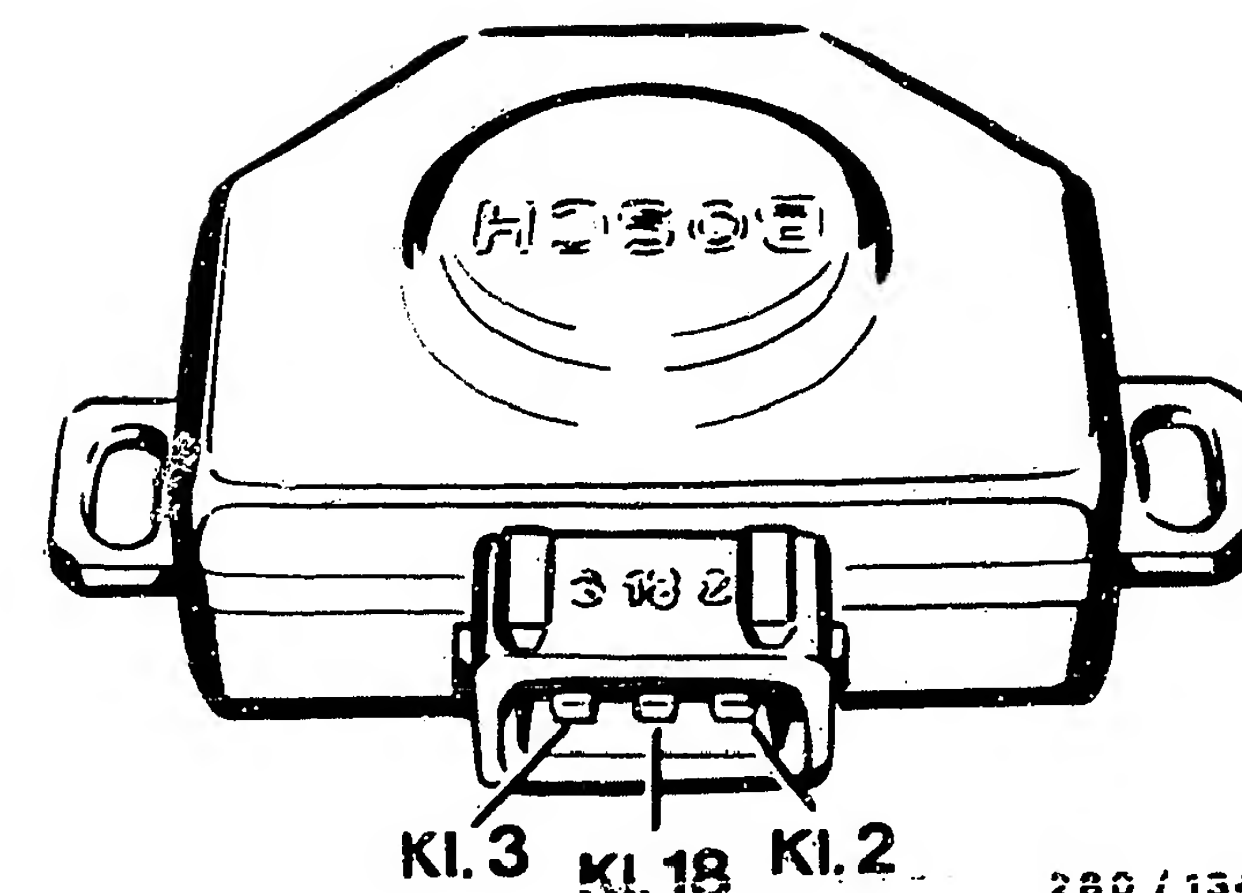
\* From control-unit plug  
term. 14 to throttle-valve  
switch term. 3.

Eliminate open-circuit/  
contact resistance.



227 / 354

Top view of control-unit plug



280 / 1347

Continued on next picture page



Component/function:

Ignition system, leads/  
term. 1 or TD engine-speed  
signals at L3 control unit.

* Operation:	Position
Prog. switch "V"	⇒
Prog. switch "Ω"	5
Test button	—

\* Measuring equipment:  
Ignition oscilloscope

\* Measuring range:  
Special input  
Control lever, left stop  
Measuring range 20V

\* Connection:  
Test recesses

\* Trigger function on veh.:  
Ignition "ON" and start

\* Set values (indication):  
Ignition pulses or rectangular  
pulses, voltage magnitude  
at least 80% of battery  
voltage.

Pulses present?

N&gt;

Trouble-shooting:

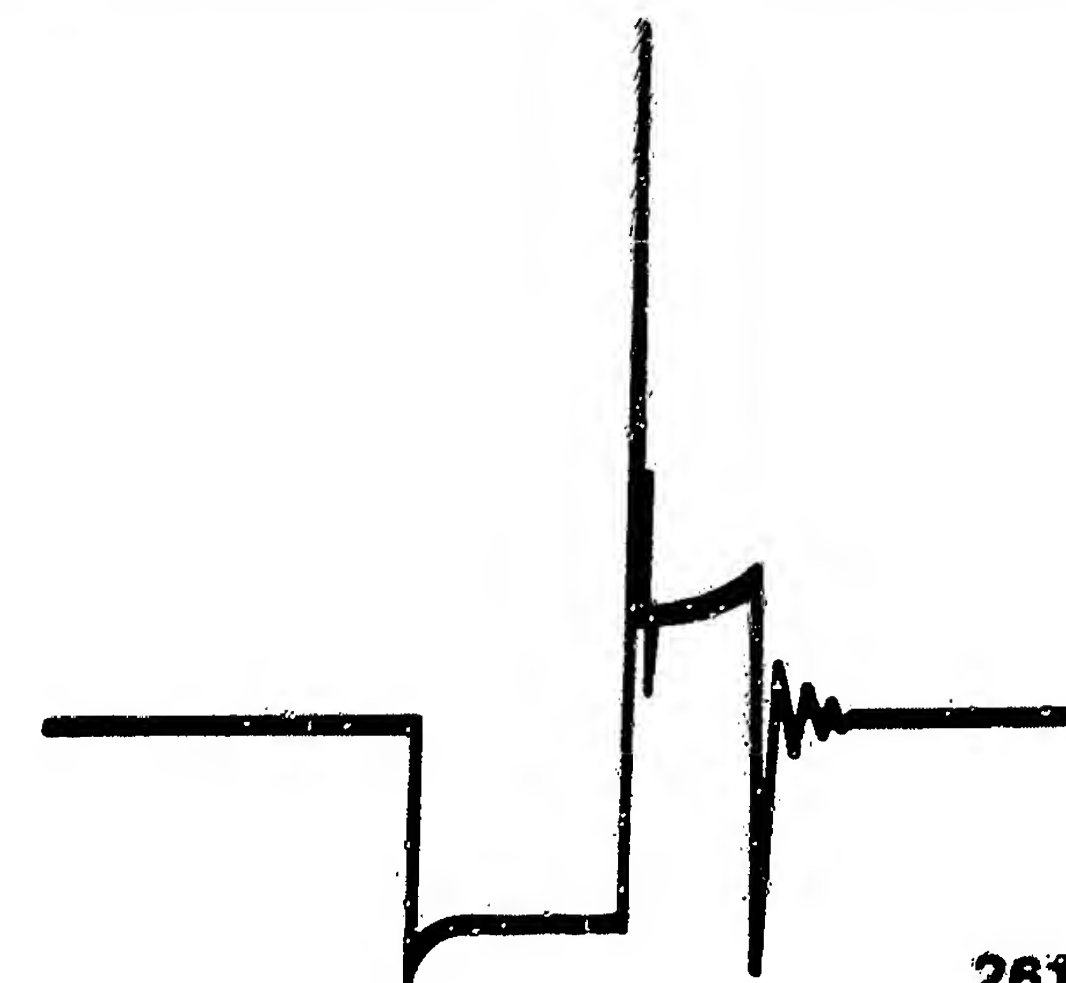
For testing, disconnect  
control-unit plug from test  
adapter.

Check the following leads  
for continuity with ohmmeter,  
Set value approx. 0 Ω :

- \* From control-unit plug term. 1  
to ignition coil term. 1
- \* In case of TD signal, from  
control-unit plug term. 1 to  
ignition control unit.

If leads O.K., check ignition  
system.

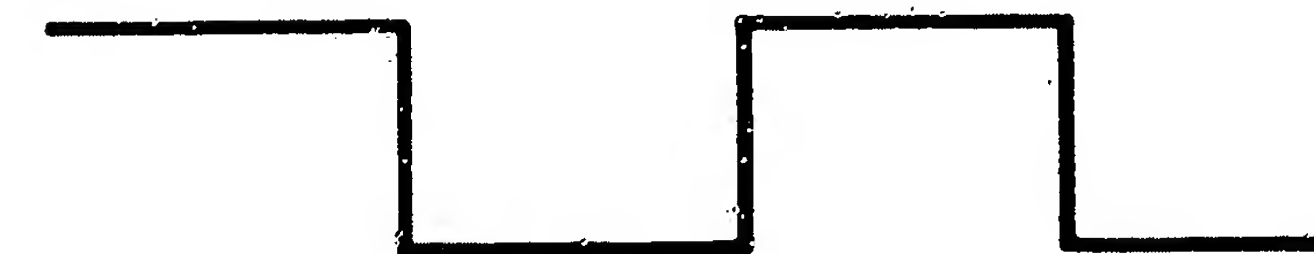
Eliminate open circuits/  
contact resistances.



261 / 0212

Term. 1 signal from term. 1  
ignit. coil (primary signal)

TD signal from ignition  
trigger box.



280 / 0831

Continued on next picture page

Component/function:

Main relay, leads/voltage supply of control unit.

N&gt;

* Operation:	Position
Prog. switch "V"	=>
Prog. switch "Ω"	6
Test button	—

\* Measuring equipment:  
Motortester or multimeter

\* Measuring range:  
approx. 20V

\* Connection:  
Test socket, red (+)  
Test socket, black(-)

\* Trigger function on veh.:  
Ignition "ON"

\* Set value (indication):  
8...15V

Is measured value inside  
set-value tolerance?

Y  
V

Continued on next picture page

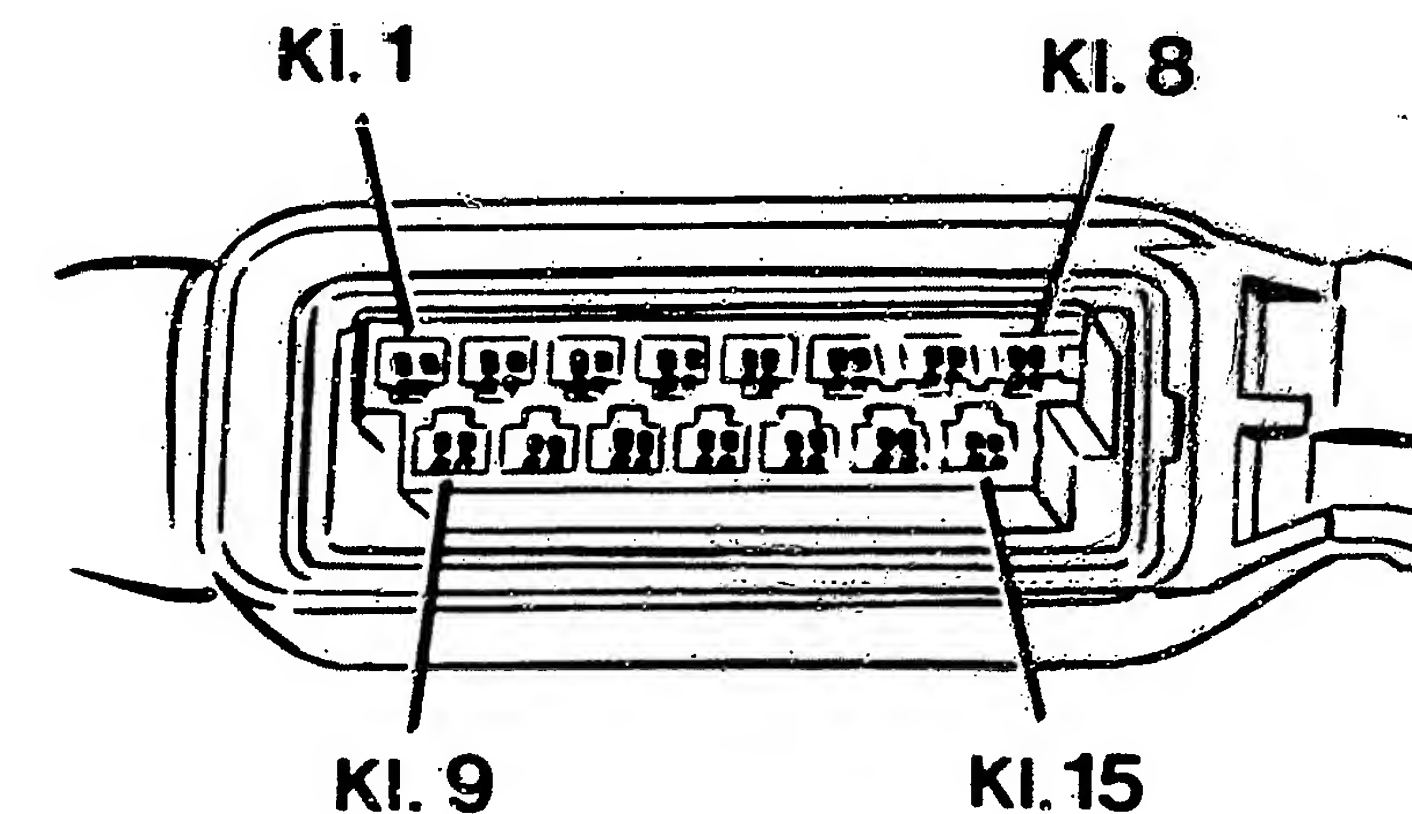
Trouble-shooting:

For testing, disconnect  
control-unit plug from test  
adapter. Remove main  
relay from plug-in base.

Check the following lead  
for continuity with ohmmeter,  
set value approx. 0 Ω :

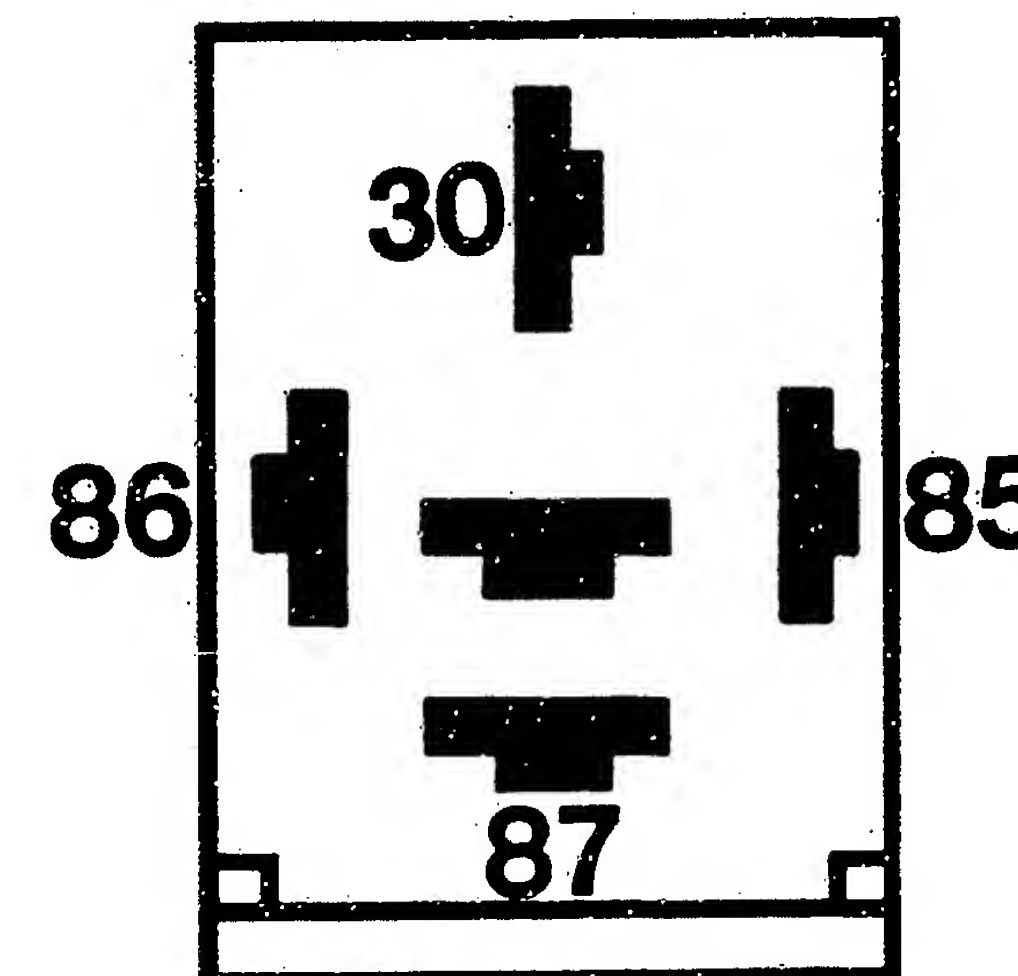
- \* From control-unit plug  
term. 2 to main relay term. 87
- \* Voltage supply at main relay  
term. 86 against term. 85  
With ignition "on": 8...15V  
If not, check lead term. 86  
to term. 15 (ignition/starting  
switch) and ignition/starting  
switch.
- \* Check lead term. 85 to  
vehicle ground.
- \* Voltage at main relay term. 30  
against term. 85: 8...15V  
If not, check lead term. 30  
to battery (+).
- \* Connect main relay in plug-  
in base.  
With ignition "on": relay  
must pull in.  
If not => replace main relay.

Eliminate open circuits/  
contact resistances.



227 / 354

Top view of control-unit plug

Top view of connection  
base.

280/0936



Component/function:

Pump relay, leads/winding and voltage supply (+) of pump relay.

\* Operation:

Position	
Prog. switch "V"	=>
Prog. switch "Ω"	■
Test button	—

\* Measuring equipment:

Motortester or multimeter

\* Measuring range:

approx. 20V

\* Connection:

Test socket, red (+)  
Test socket, black(-)

\* Trigger function on veh.:

Ignition "ON"

\* Set value (indication):

8...15 V

Is measured value inside set-value tolerance?

N>

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter.

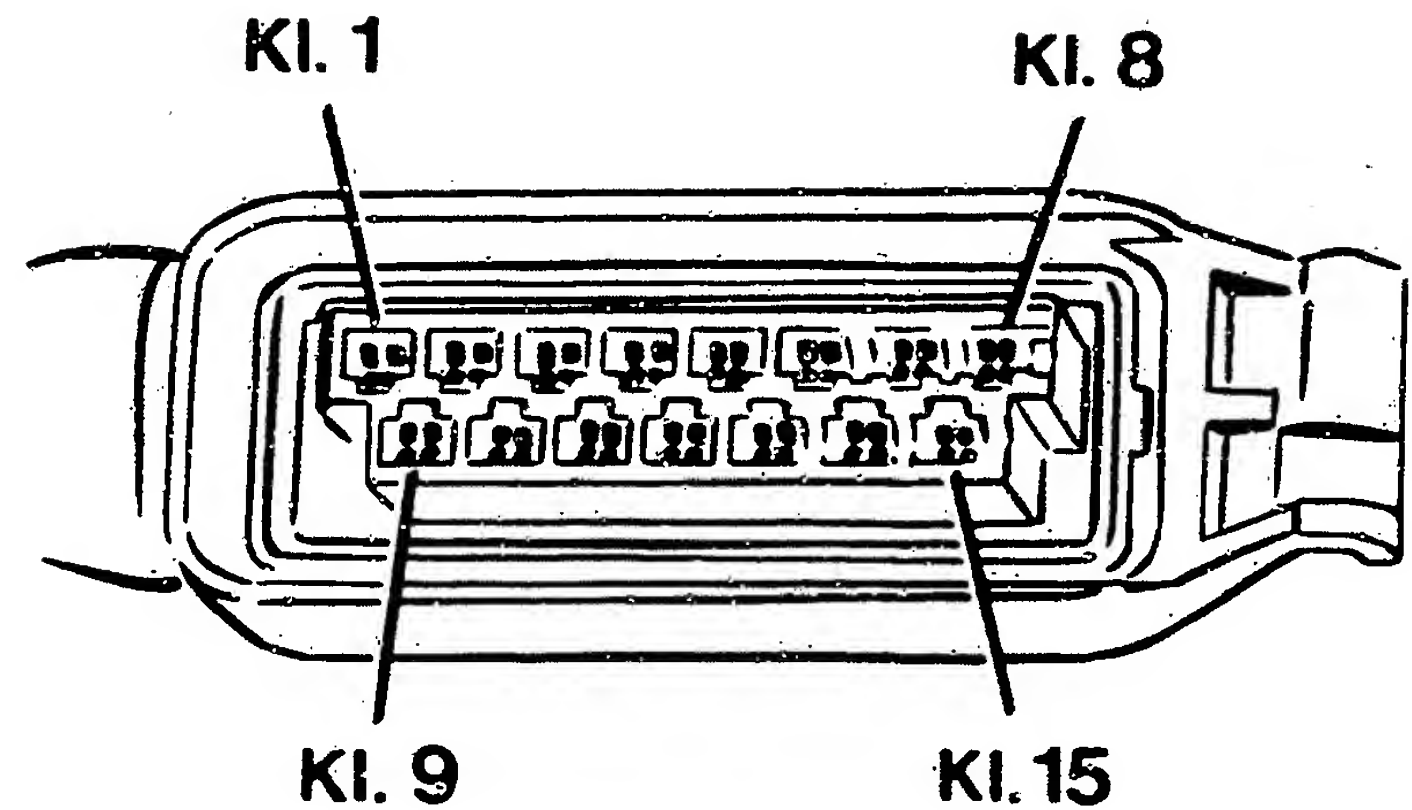
Check the following leads for continuity with ohmmeter, Set value approx. 0 Ω :

\* From control-unit plug term. 12 to pump relay term. 85

\* From pump relay term. 86 to main relay term .87

If leads O.K. => replace pump relay.

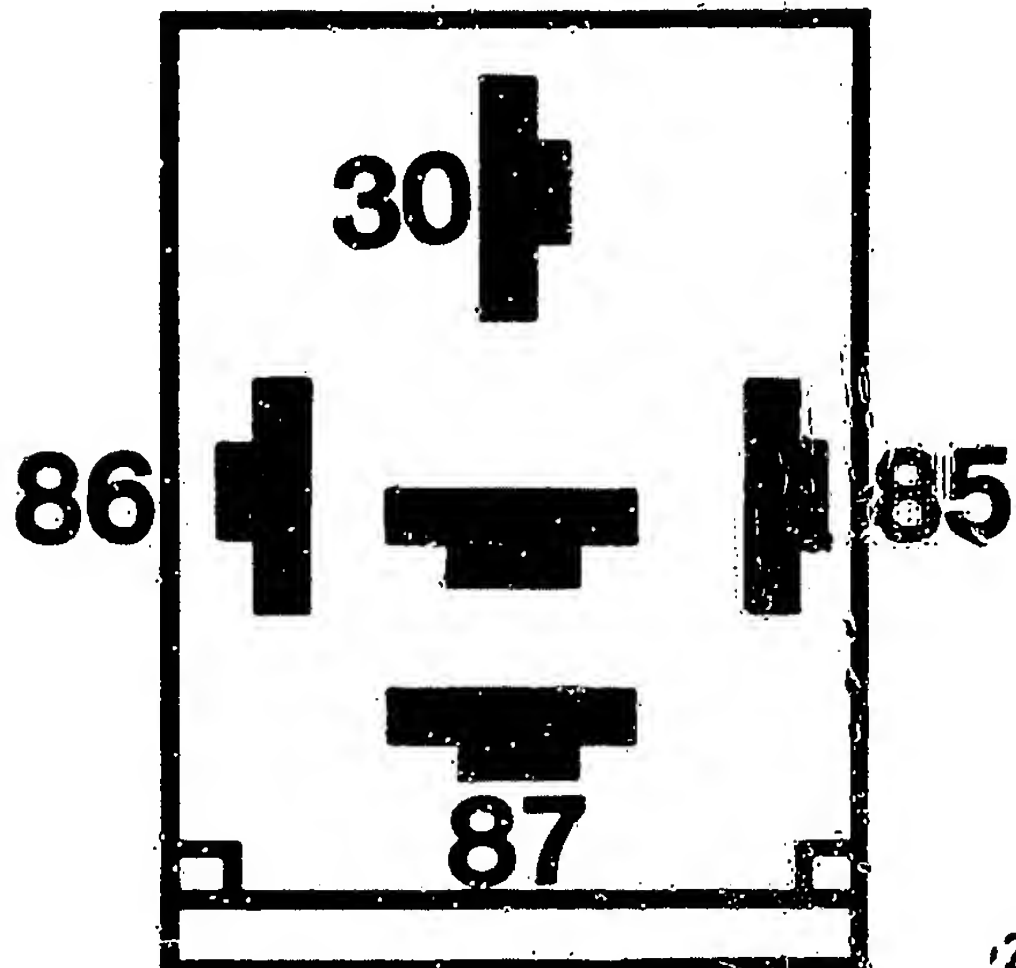
Eliminate open circuits/contact resistances.



227 / 354

Top view of control-unit plug

Top view of connection base.



280/0936

Component/function:

Pump relay, leads,  
electric fuel pump/simulated  
actuation of electric  
fuel pump

N&gt;

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	10
Test button	3

\* Measuring equipment: —

\* Measuring range: —

\* Connection: —

\* Trigger function on veh.:  
Detach connector from  
auxiliary-air device.  
Ignition "ON"

\* Set value (indication):  
Electric fuel pump must run,  
listen to check

Does electric fuel pump  
run?

Trouble-shooting:

For testing, disconnect  
control-unit plug from test  
adapter.

Measure voltage at pump  
relay term. 30 to vehicle  
ground.

Set value: 8...15V

If not, check the following  
leads for continuity with  
ohmmeter

Set value approx. 0 Ω .

- \* Check lead term. 30 from  
pump relay to battery for  
continuity.

If lead O.K. => replace  
pump relay.

Measure voltage directly  
at electric fuel pump.

Connect test adapter.

Press test button 3.

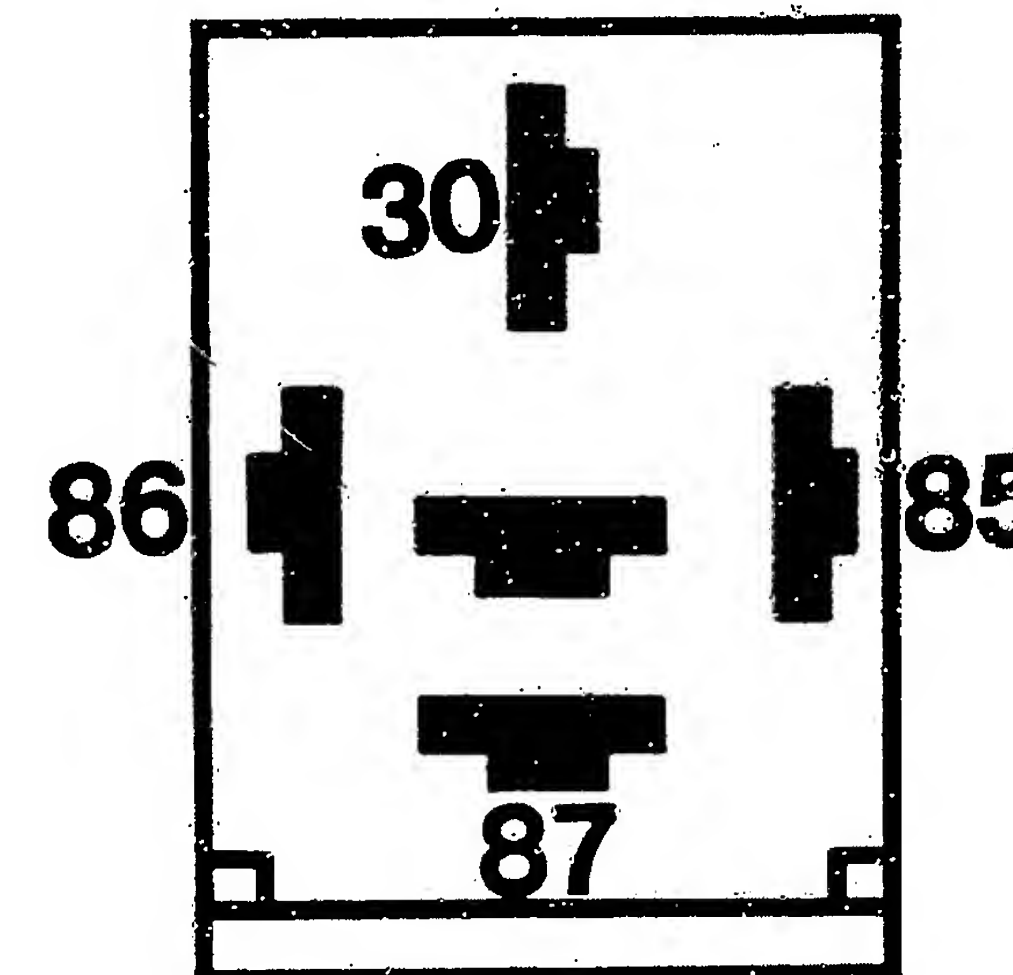
Set value: 8...15 V

If not, check the following  
leads for continuity with  
ohmmeter

Set value approx. 0 Ω .

- \* From electric fuel pump to  
pump relay term. 87.
- \* From electric fuel pump to  
vehicle ground.

If leads O.K. => replace  
electric fuel pump.



280/0936

Top view of connection  
base.

Continued on next picture page



Component/function:

Auxiliary-air device, leads/  
simulation of auxiliary-air device

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	10
Test button	3

N&gt;

\* Measuring equipment:  
Mirror

\* Measuring range: —

\* Connection:

Test recess, red (+)  
Test recess, black (-)

\* Trigger function on veh.:  
Attach connector of  
auxiliary-air device.  
Ignition "On"

\* Set value (indication):  
Plate must close off  
air cross-section.

Is measured value within  
set-value tolerance?

Trouble-shooting

Disconnect hoses and look  
down auxiliary-air device  
(possibly using a small  
mirror).

Press test button 3:  
Plate must close slowly.  
If not, measure voltage  
at plug of auxiliary-air  
device.

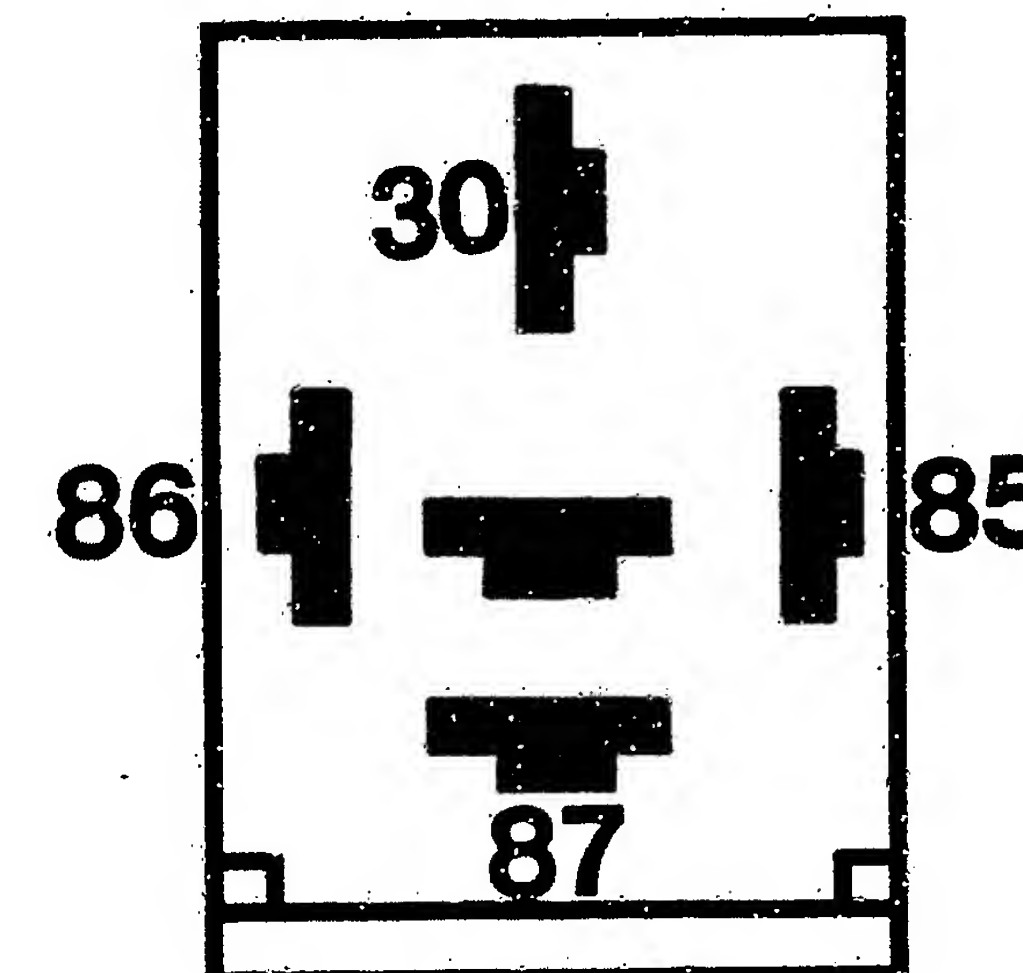
Press test button 3.  
Set value: 8...15V

If not, check the following  
leads for continuity

Set value approx. 0 Ω :

- \* From plug of auxiliary-air  
device to ground.
- \* From plug of auxiliary-air  
device to pump relay term. 87

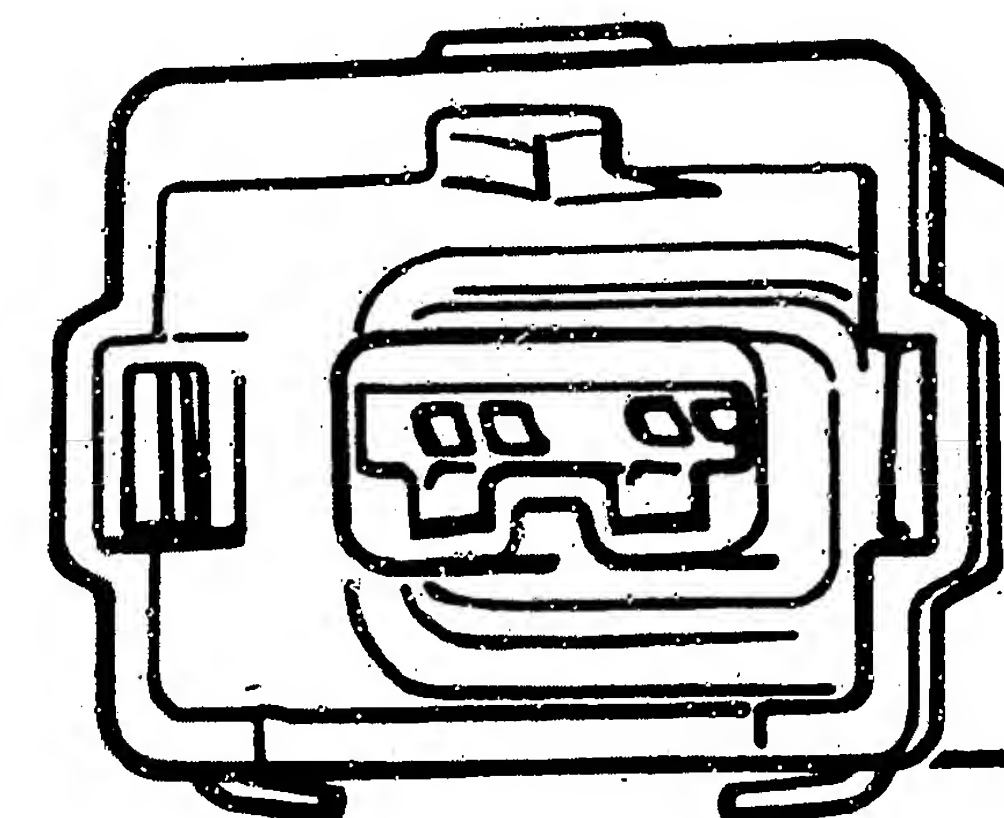
If leads O.K. => replace  
auxiliary-air device.  
Eliminate open circuits/  
contact resistances.



280/0936

Top view of connection  
base.

Connector of auxiliary-air  
device.



261/793

Continued on next picture page

V

Component/function:

Connect control unit also.  
Ground energization of pump  
relay through control unit

* Operation:	Position
Progr. switch "V"	7
Progr. switch "Ω"	10
Test button	—

N&gt;

\* Measuring equipment:  
Motortester or multimeter

\* Measuring range:  
approx. 20 V

\* Connection:  
Red test socket (+)  
Black test socket (-)

\* Operation in vehicle:  
Let engine run.

\* Set value (reading):  
0...5V

Is measured value within  
set-value tolerance?

V

V

Trouble-shooting:

Pump relay must pull in when  
starting.

If not => replace control  
unit.

See also Coordinate  
A19/20

Eliminate open circuits/  
contact resistances.

Continued on next picture page



Component/function:

Additionally connect control unit.  
Air-flow sensor, control unit/  
air-flow signal at Up output  
term. 11.

* Operation:	Position
Prog. switch "V"	8
Prog. switch "Ω"	10
Test button	—

\* Measuring equipment:  
Motortester or multimeter

\* Measuring range:  
Approx. 10V

\* Connection:  
Test socket, red (+)  
Test socket, black (-)

\* Trigger function on vehicle:  
Let engine run

\* Set value (indication):  
0...5V load-dependent

Is measured value within  
set-value tolerance?

N&gt;

Trouble-shooting:

For test purposes, detach  
control-unit plug from test adapter.

Test air-flow sensor  
separately.  
To do so, detach control unit.  
See Coordinate A19/20

Test air-flow sensor:  
Resistance between term. 3  
and term. 4  
Set value: 500...1000 Ω

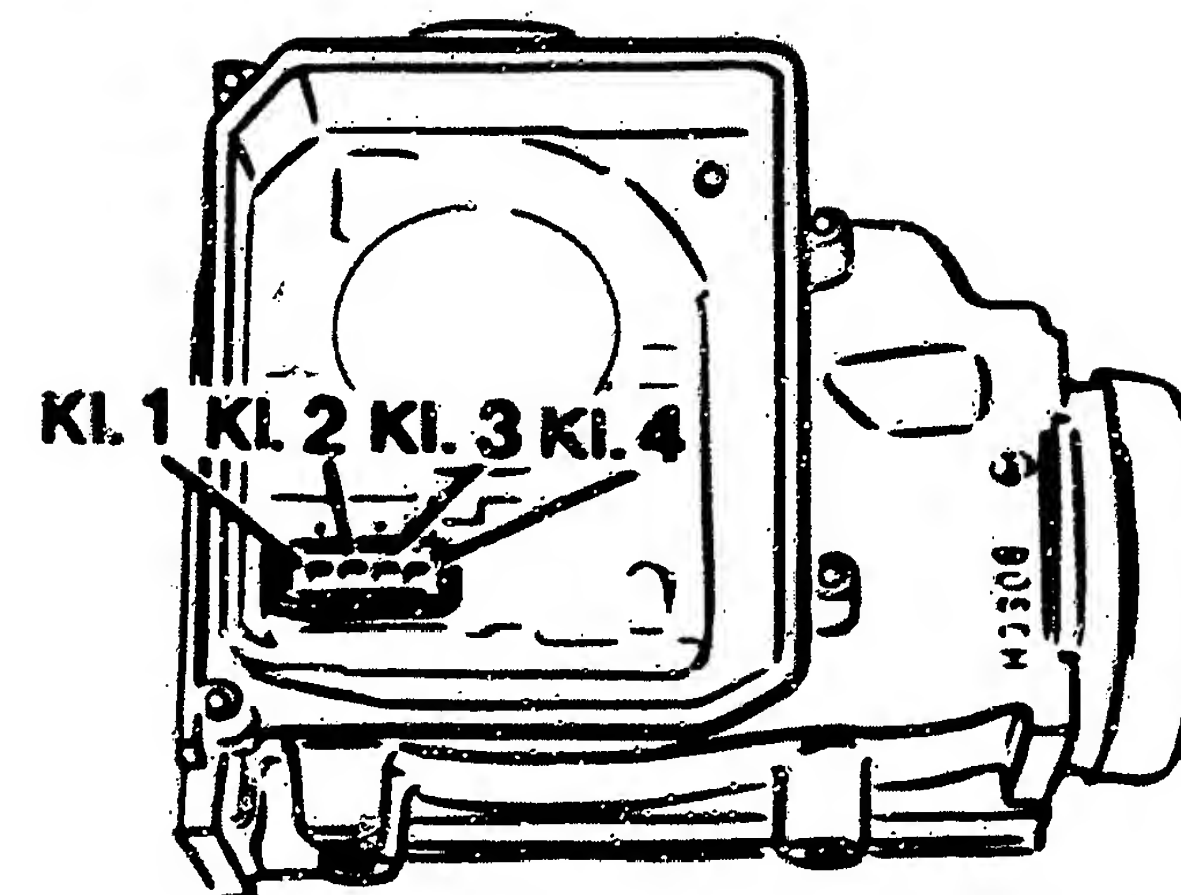
Resistance between  
term. 3 and term. 2  
Sensor flap in off position.  
Set value: 10...200 Ω  
The indication must change  
when the sensor flap is deflected.

Test intake-air temperature  
sensor:  
Resistance between term. 3 and  
term. 1  
Set value:  
at ambient temperature,  
+15...+30°C: 1.45...3.3k Ω

If a set value is not  
attained => renew air-flow  
sensor.

If set value is attained =>  
renew control unit.  
Refer to Coordinate A19/20

Eliminate open-circuit/  
contact resistance.



280 / 1349

Continued on next picture page

Component/function:

Additionally connect control unit.

1. Pressure sensor, leads/potentiometer voltage of altitude sensor.
2. If no pressure sensor is fitted, term. 7 and term. 2 must be jumpered.

* Operation:	Position
Prog. switch " V "	9
Prog. switch " $\Omega$ "	10
Test button	—

\* Measuring equipment:  
Motortester or multimeter

\* Measuring range:  
approx. 20V

\* Connection:  
Test socket, red (+)  
Test socket, black (-)

\* Trigger function on veh.:  
Let engine run

\* Set value (indication):

1. At 980 mbar (300m) : 2...4 V  
At 615 mbar (4000m): 8...12 V
2. If term. 7 and term. 2 are jumpered: 8...15 V

Is measured value within set-value tolerance?

Trouble-shooting:

For test purposes, detach control-unit plug from test adapter.

1. Measure resistance directly at altitude sensor,  
between term. 2 and term. 3  
Set value: 2.3...2.8 k  $\Omega$   
between term. 2 and term. 1  
Set value: 2.0...2.7 k  $\Omega$

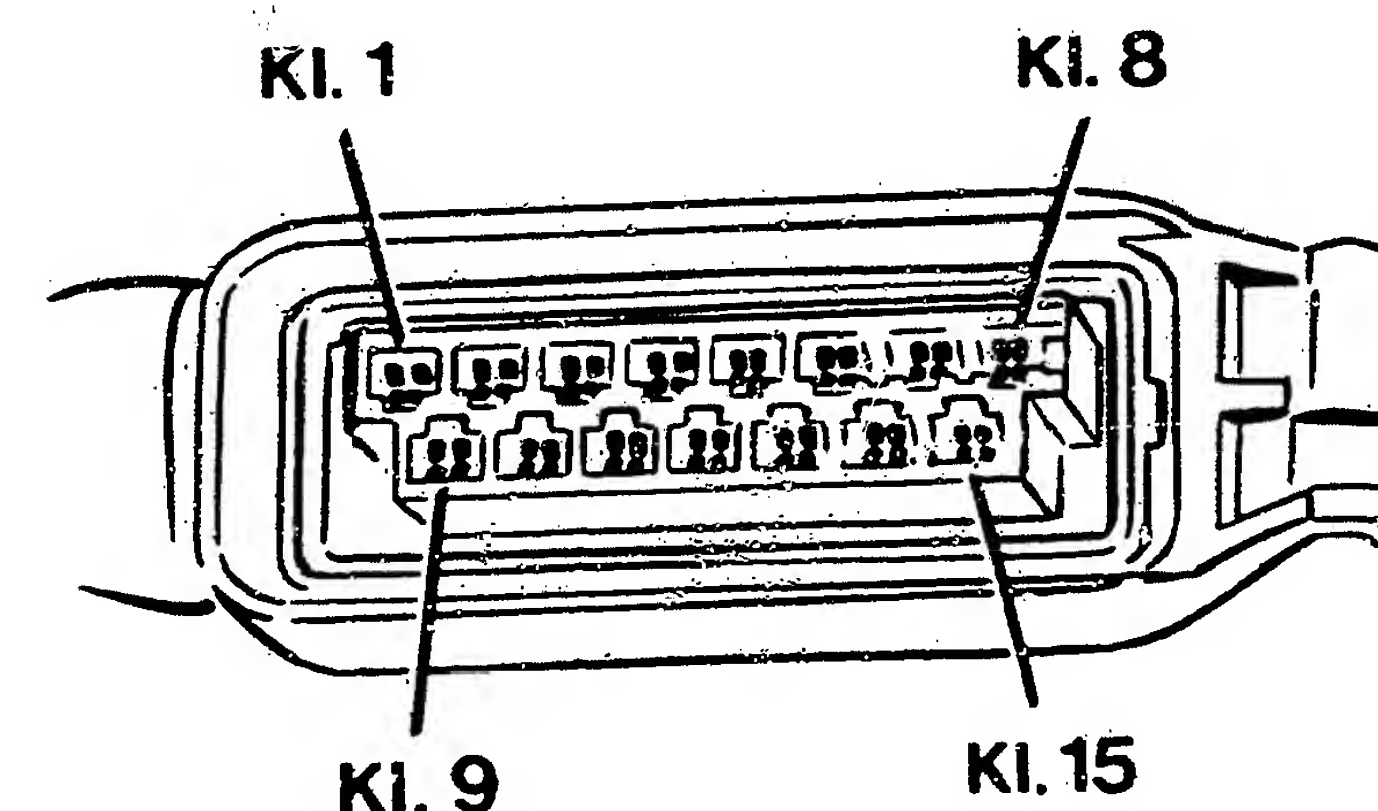
If set values are not attained => renew altitude sensor.

Use ohmmeter to test following leads for continuity

Set value approx. 0  $\Omega$  :

- \* From altitude sensor term. 1 to control-unit plug term. 7
  - \* From altitude sensor term. 3 to main relay term. 87
  - \* From altitude sensor term. 2 to vehicle ground.
2. Between control-unit plug term. 7 and term. 2.

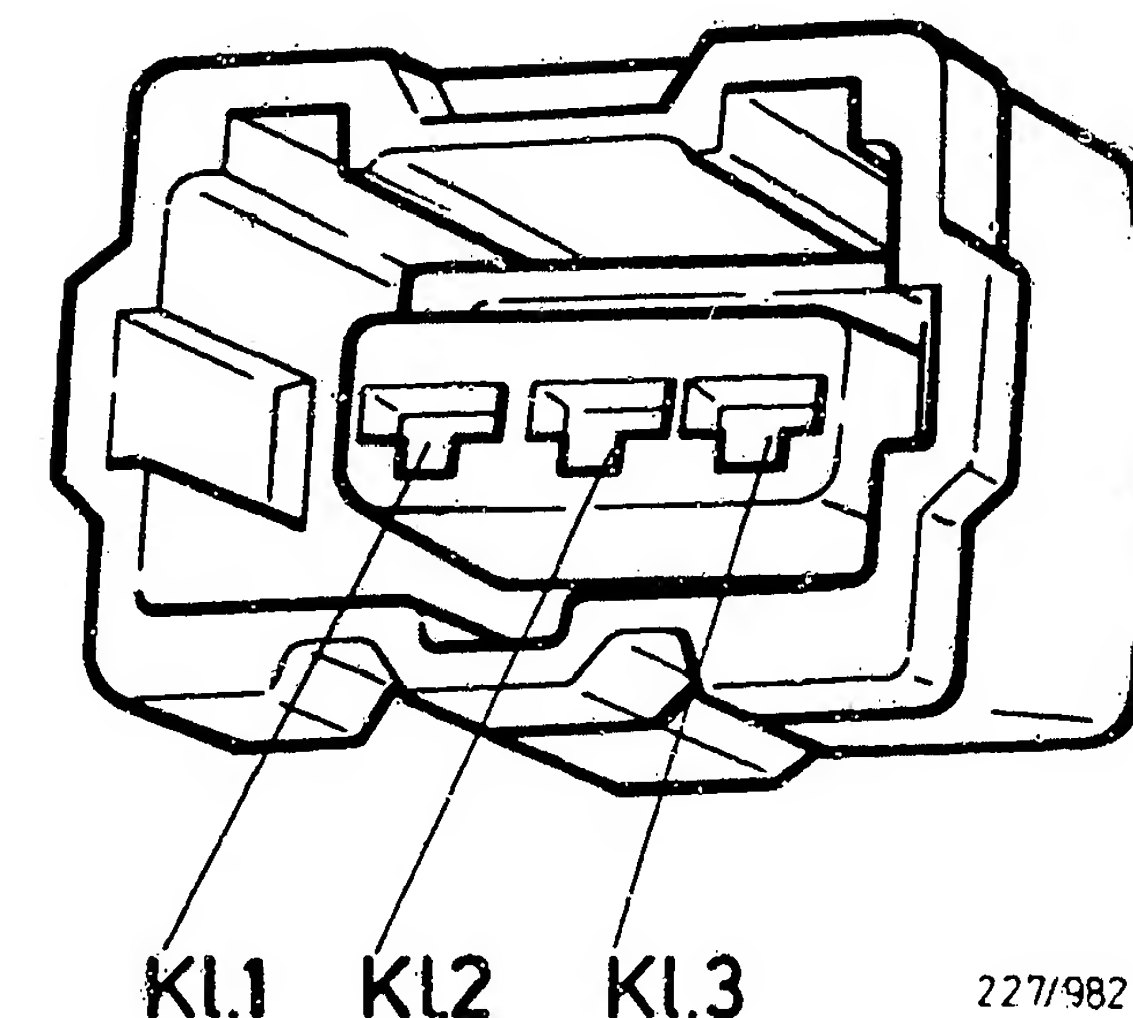
Eliminate open-circuits/contact resistance.



227 / 354

Top view of control-unit plug

Top view of plug of altitude pickup



227/982

Continued on next picture page



Component/function:

Additionally connect control unit.  
Injection valves, control unit, leads/injection pulses from control unit.

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	10
Test button	—

\* Measuring equipment:  
Motortester, oscilloscope

\* Measuring range:  
Special input 20 V

\* Connection:  
Test recess, red (+)  
Test recess, black (-)

\* Trigger function on veh.:  
Let engine run

\* Set value (indication):  
Injection pulses on oscilloscope

Are injection pulses visible?

N&gt;

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter.

Resistance between control-unit plug term. 3 and pump relay term. 87

Set value:

4-cyl. engine: 3.5...5.0 Ω

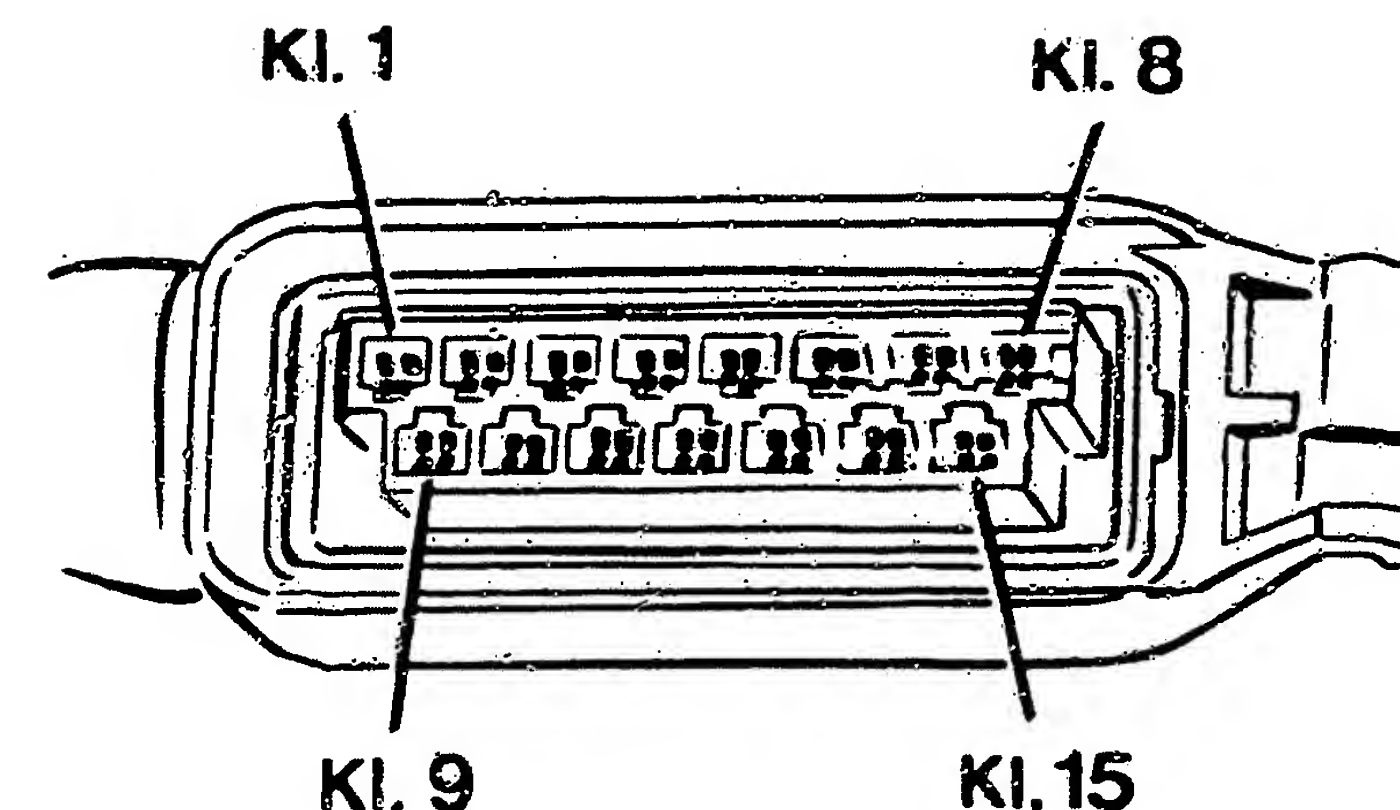
6-cyl. engine: 2.2...3.5 Ω

If set value not obtained, measure resistances of injection valves individually.  
Set value: 14.5...17 Ω  
If set value not obtained  
=> replace injection valve.

If set value obtained, check the following leads for continuity with ohmmeter.  
Set value approx. 0 Ω.

- \* From control-unit plug term. 3 to the individual connectors of the injection valves.
- \* From pump relay term. 87 to the individual connectors of the injection valves.

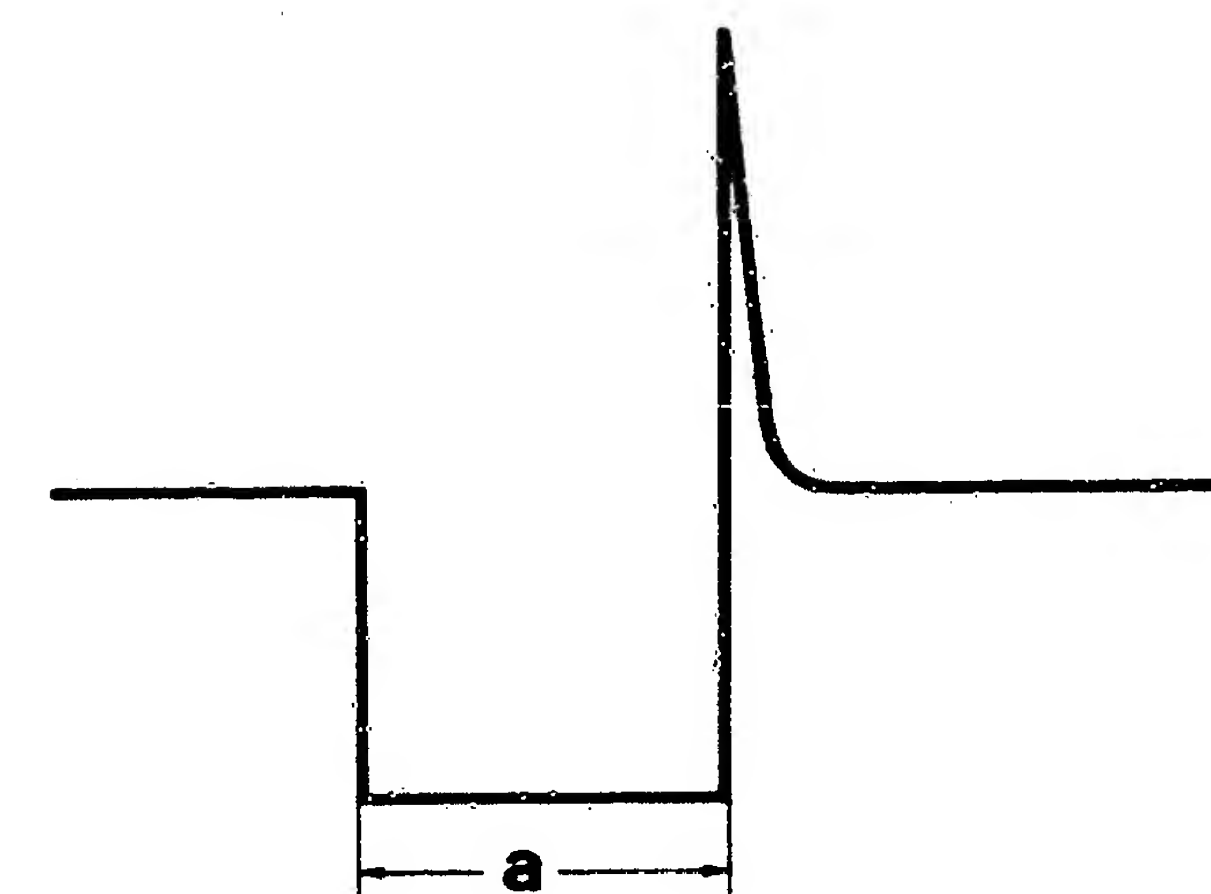
If leads O.K. => replace defective control unit.  
See also Coordinate A19/20  
Eliminate open circuits/contact resistances.



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Top view of control-unit plug

Injection pulses of a switched output stage (measured at the injection valve)  
a = Pulse length (dependent on engine load)



280 / 0249

Continued on next picture page

**Component/function:**

Additionally connect control unit.  
Lambda sensor, leads/sensor  
monitoring

* Operation:	Position
Prog. switch "V"	
Prog. switch "Ω"	
Test button	

\* Measuring equipment:  
Motortester or multimeter

\* Measuring range:  
approx. 20V

\* Connection:  
Test socket, red (+)  
Test socket, black (-)

\* Trigger function on veh.:  
Run engine at operating  
temperature approx. 80°C

\* Set value (indication):  
0...1.0 V

Is measured value within  
set-value tolerance?

**Trouble-shooting:**

Use ohmmeter to test following  
leads for continuity  
approx. 0 Ω ,

- \* From heater plug to  
pump relay term. 87.
- \* From heater plug to  
vehicle ground.
- \* From sensor housing  
to vehicle ground.  
Detach control-unit  
plug.  
From sensor plug to  
control-unit plug term. 13.

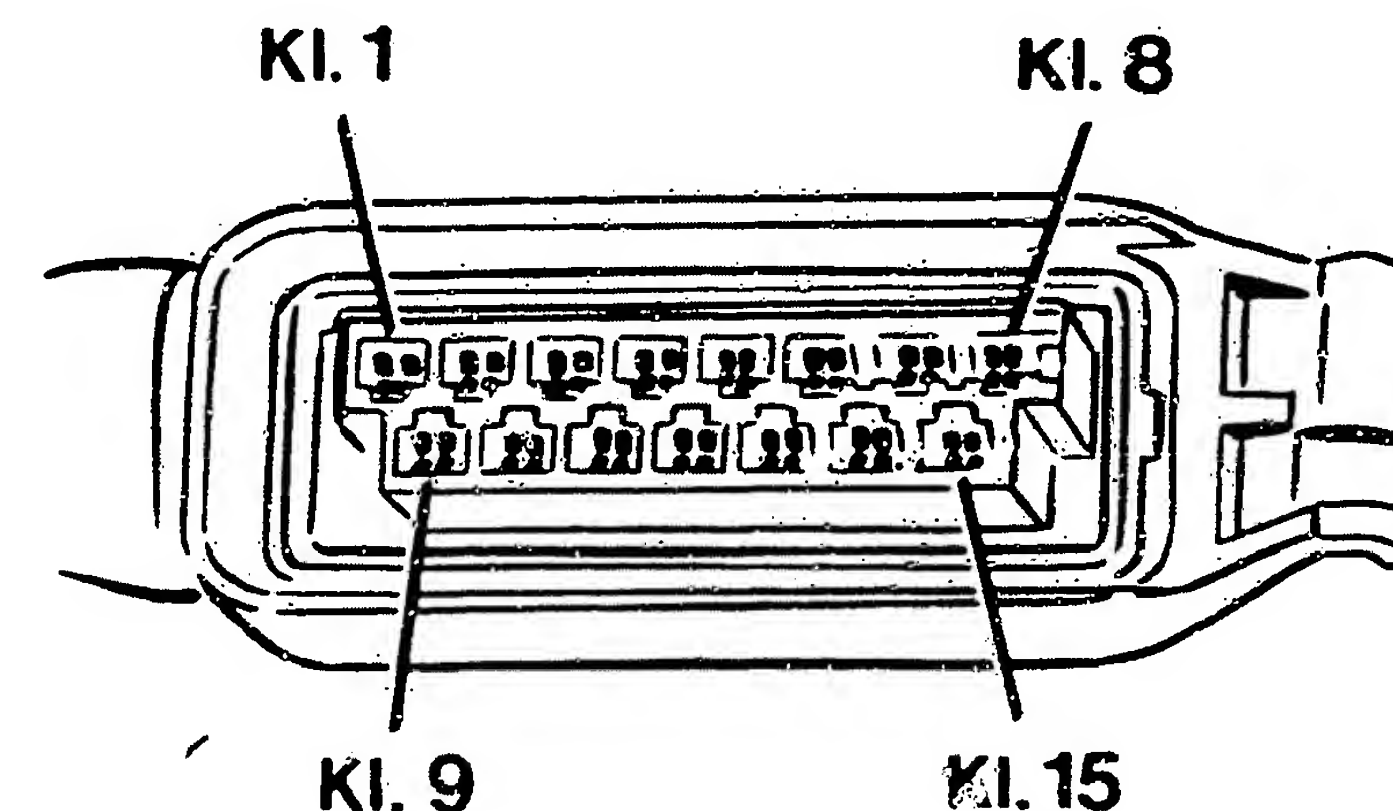
Test shield term. 5 to sensor  
lead term. 13,  
resistance at least 1 M Ω .  
Attach control-unit plug.

Run engine at operating temperature  
If set value is now  
attained → continue with  
next micro-picture.

If reading is 8...15 V →  
test sensor heater,  
internal resistance: 1...15 Ω .

Use digital multimeter  
(R1 greater than 1 M Ω ) to measure  
sensor signal with respect to ground.  
Sensor voltage: 0.05...1.0 V.  
If a value is not attained  
→ renew lambda sensor.

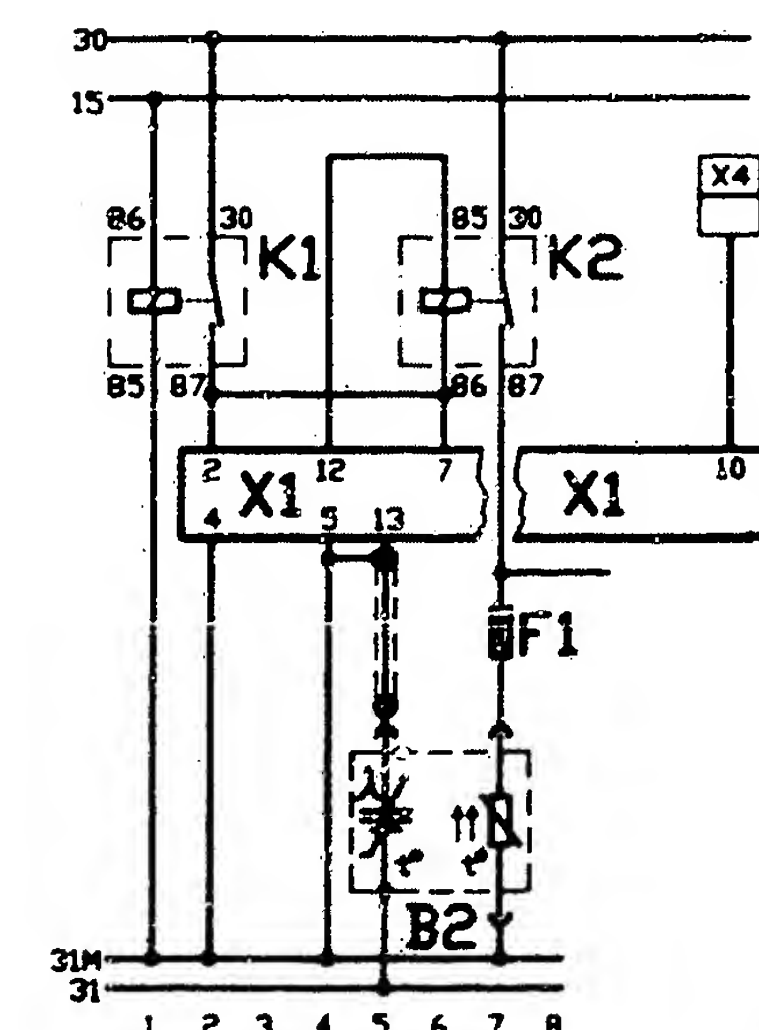
Only coat sensor thread with a  
small amount of grease Vs 140 16 Ft.



227 / 354

Top view of control-unit plug

B2 = Heated lambda sensor  
K1 = Main relay  
K2 = Pump relay  
X1 = Control-unit plug  
X4 = Test output for  
lambda closed-loop control  
(Diagnosis output)



S2801531

Continued on next picture page



Component/function:

Additionally connect control unit.  
Control unit, leads/reference  
voltage UV-output to term. 9.

* Operation:	Position
Prog. switch "V"	12
Prog. switch "Ω"	10
Test button	—

\* Measuring equipment:  
Motortester or multimeter

\* Measuring range:  
approx. 10 V

\* Connection:  
Test socket, red (+)  
Test socket, black (-)

\* Trigger function on veh.:  
Run engine

\* Set value (indication):  
3.5...4.5 V

Is measured value within  
set-value tolerance?

N&gt;

Trouble-shooting:

For testing, disconnect  
control-unit plug from  
test adapter.

Disconnect the loads (e.g.  
ignition control unit)  
connected to control unit  
term. 9.

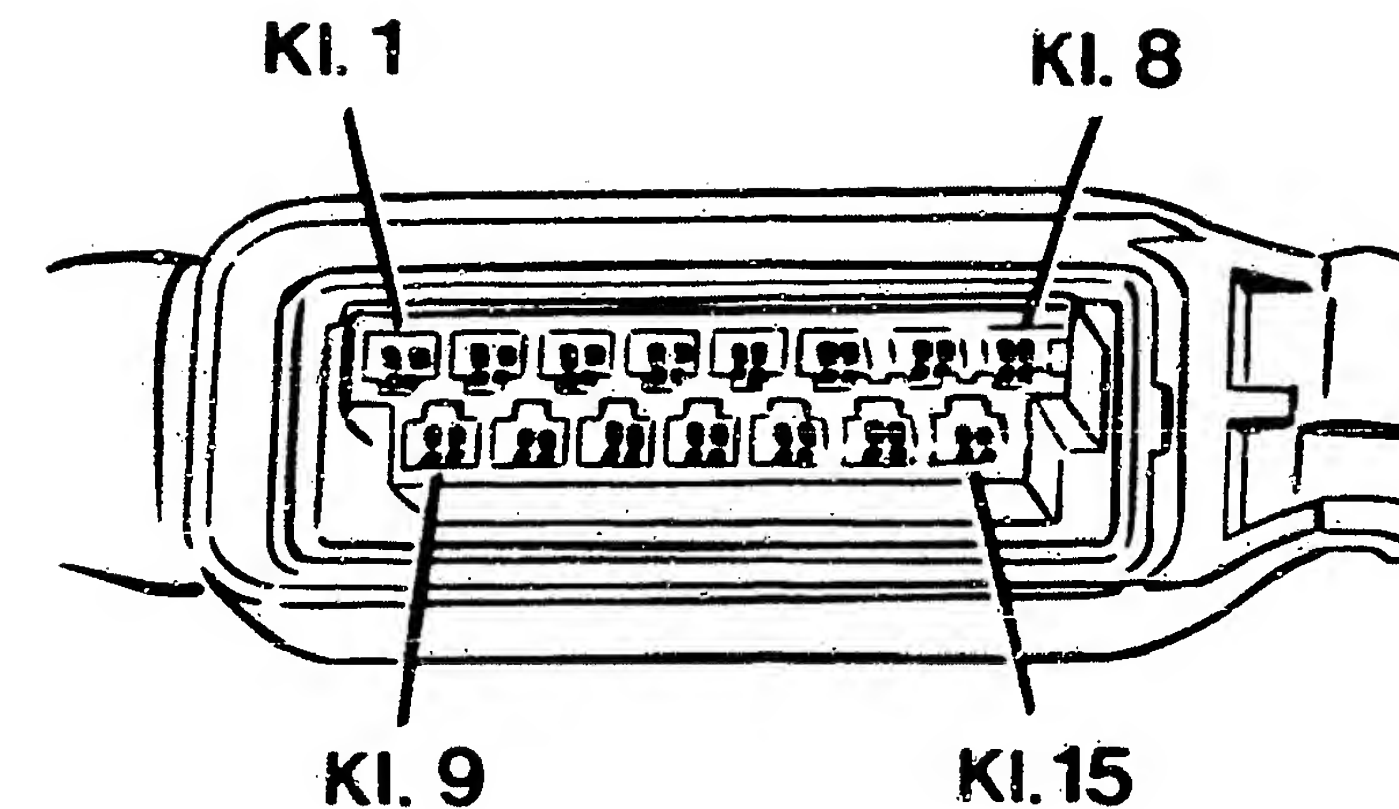
Measure shielded lead at  
control unit term. 9 to  
vehicle ground.

Set value: infinity Ω

Is set value now obtained?  
If yes → check loads.  
If not → replace defective  
control unit.

See also Coordinate A19/20

Eliminate open circuits/  
contact resistances.



227 / 354

Top view of control-unit plug

Continued on next picture page

Component/function:

Connect control unit also.  
Simulation of cold engine

* Operation:	Position
Progr. switch "V"	10
Progr. switch "Ω"	10
Test button	1

N&gt;

Trouble-shooting:

If set value not obtained  
=> replace control unit.

See also Coordinate A19/20

\* Measuring equipment:

Motortester, oscilloscope

\* Measuring range:

Special input 20 V

\* Connection:

Red test wells (+)

Black test wells (-)

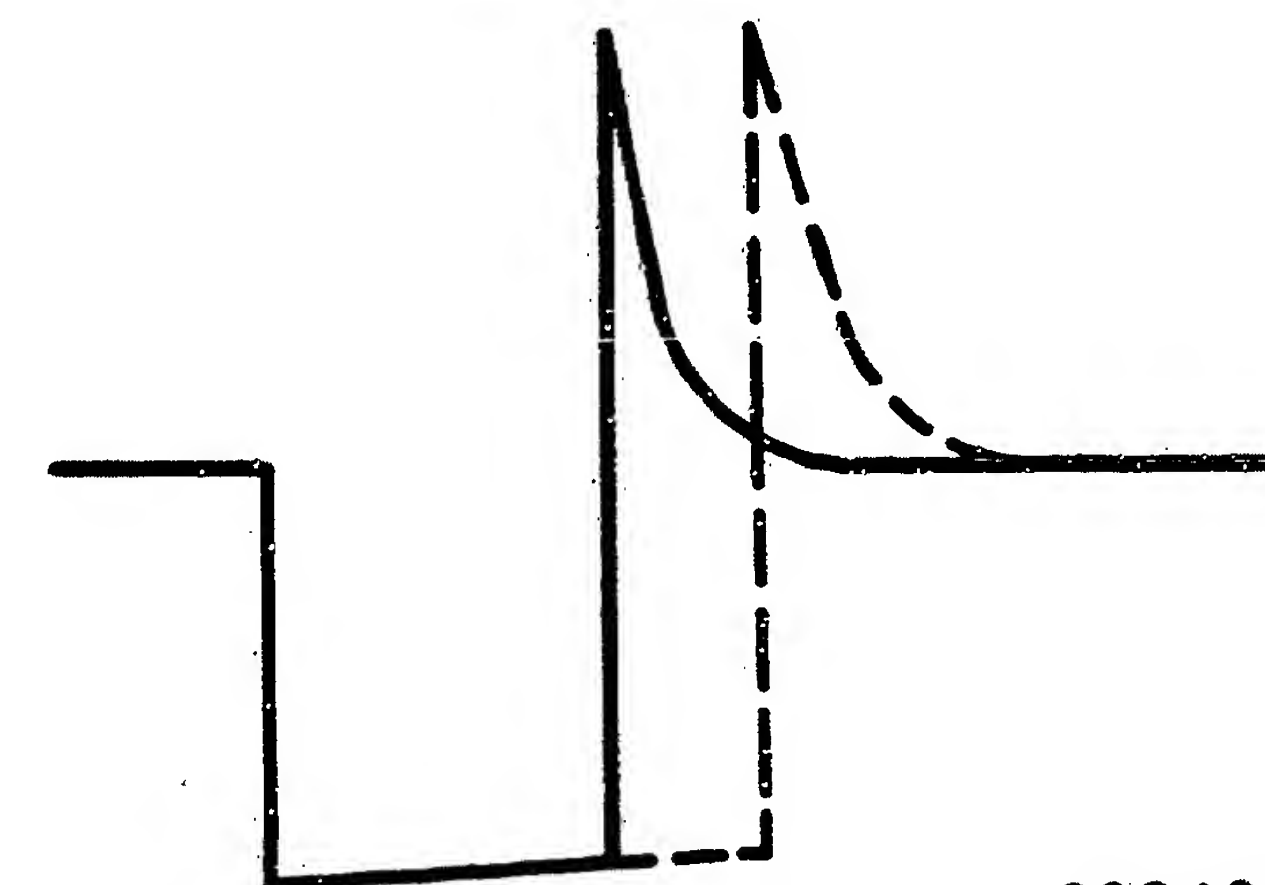
\* Operation in vehicle:

Let engine run

\* Set value (reading):

Injection pulse must become  
wider, or engine speed must  
drop.

Does injection pulse  
become wider?



280/0918

Wider injection signal  
after pressing button T 1

Continued on next picture page

# TEST STEP 17

( TEST SPECIFICATIONS AND NOTES ON OPERATION )

V

## Component/function:

Connect control unit also.  
Simulation of warm engine

* Operation:	Position
Progr. switch "V"	10
Progr. switch "Ω"	10
Test button	2

N>

## Trouble-shooting:

If set value not obtained  
=> replace control unit.

See also Coordinate A19/20

## \* Measuring equipment:

Motortester, oscilloscope

## \* Measuring range:

Special input 20 V

## \* Connection:

Red test wells (+)

Black test wells (-)

## \* Operation in vehicle:

Let engine run

## \* Set value (reading):

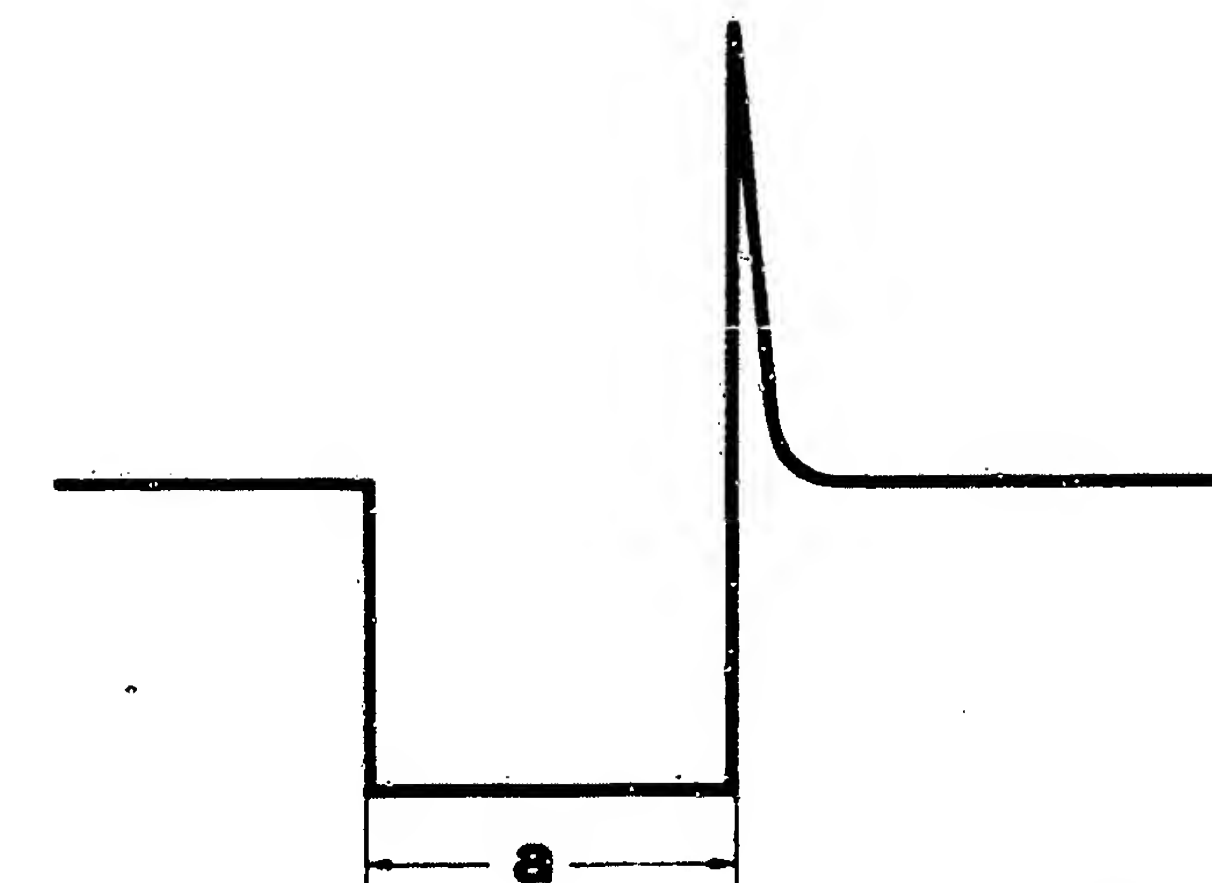
Injection pulse must not  
become wider

Does injection pulse  
remain the same?

V

V

Continued on next picture page



280/0249

Injection pulses of a switched  
output stage (measured at the  
injection valve)  
a = Pulse length (dependent  
on engine load)



V

Component/function:

Connect control unit also.  
Simulation of overrun cutoff

* Operation:	Position
Progr. switch "V"	10
Progr. switch "Ω"	10
Test button	5

N&gt;

Trouble-shooting:

If set value not obtained  
=> replace control unit.

See also Coordinate A19/20

\* Measuring equipment:

Motortester, oscilloscope

\* Measuring range:

Special input 20 V

\* Connection:

Red test wells (+)

Black test wells (-)

\* Operation in vehicle:

Engine speed above  
2000 min<sup>-1</sup>

\* Set value (reading):

Injection pulse stops/engine  
hunts

Do injection pulses stop?

Y

V

Continued on next picture page

V

Component/function:

Connect control unit also.

Simulation of full-load enrich.

\* Operation:

Progr. switch "V"	10
Progr. switch "Ω "	10
Test button	6

\* Measuring equipment:

Motortester, oscilloscope

\* Measuring range:

Special input 20 V

\* Connection:

Red test wells (+)

Black test wells (-)

\* Operation in vehicle:

Engine speed above 2000 min<sup>-1</sup>

\* Set value (reading):

Slight change in injection pulse/engine speed.

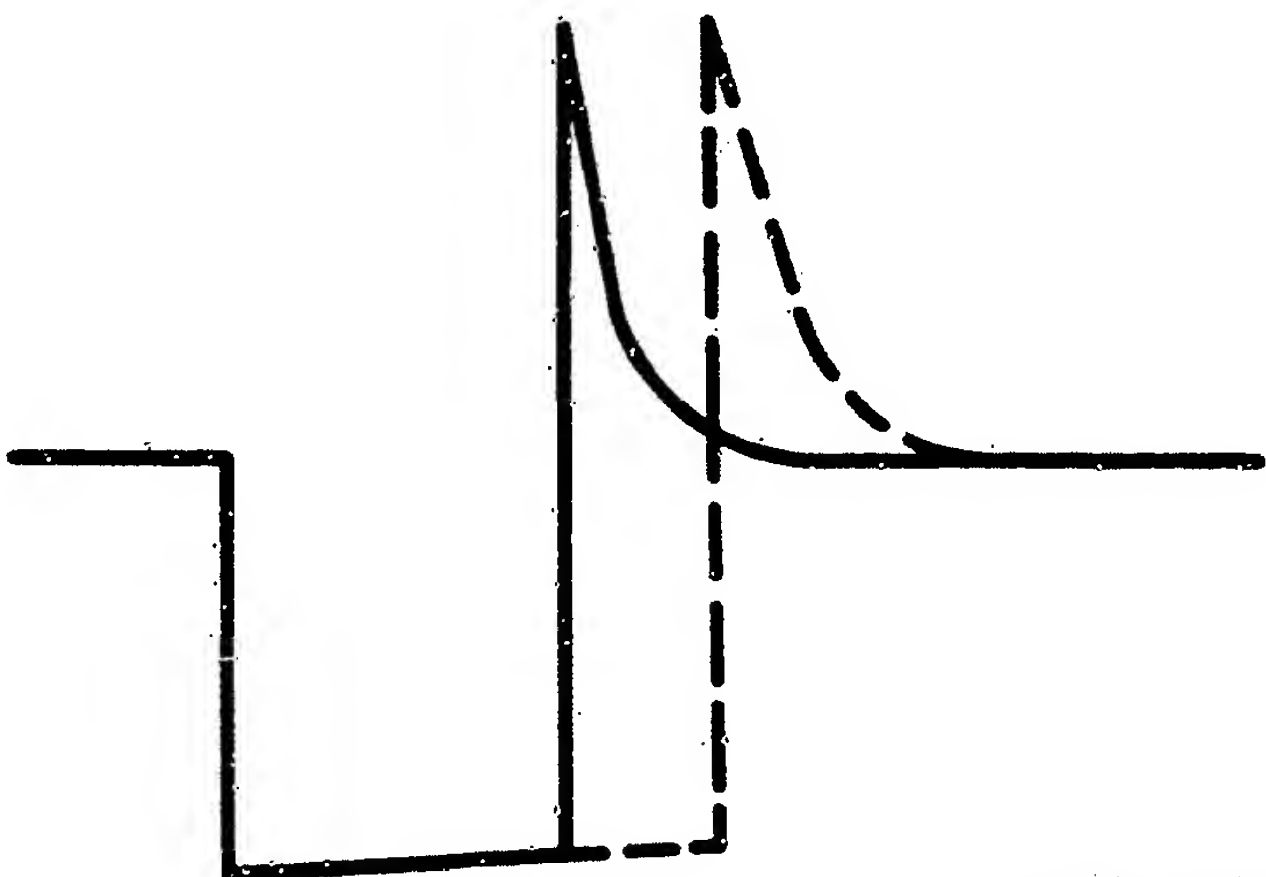
Change in pulse/engine speed?

N>

Trouble-shooting:

If set value not obtained  
=> replace control unit.

See also Coordinate A19/20



280/0918

Changed injection signal after pressing button T 6.

V

Continued on next picture page

Component/function:

Additionally connect control unit.  
Measurement output, lambda  
closed-loop control  
(Mixture control)

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	11
Test button	4

\* Measuring equipment:

Motortester or multimeter

\* Measuring range:

Approx. 20 V

\* Connection:

Test socket, red (+)  
Test socket, black (-)

\* Trigger function on veh.:

Run engine at operating  
temp., approx. +80°C

\* Set value (indication):

Uniformly fluctuating  
indication between 0...13 V.

Is measured value within  
set-value tolerance?

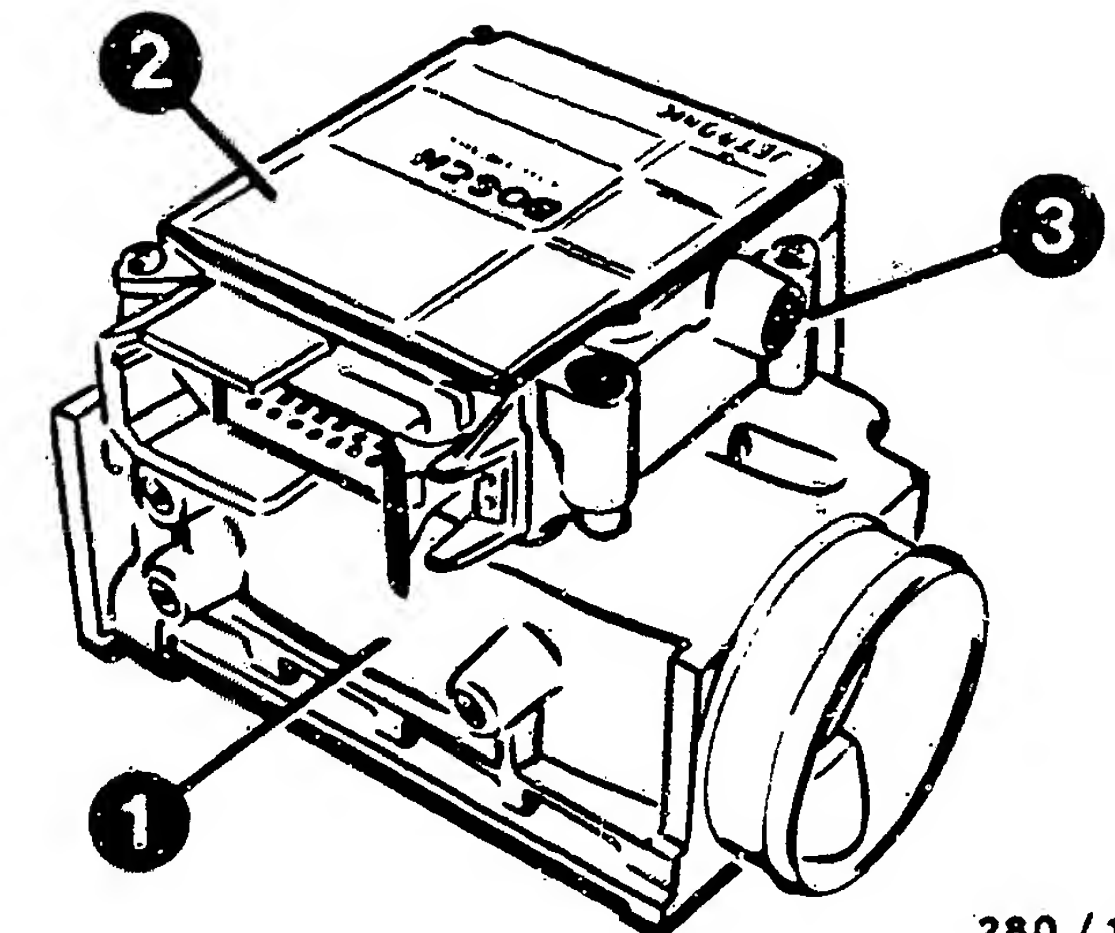
N&gt;

Trouble-shooting:

If set value is not  
attained, ensure that exhaust  
system is not leaking.

Perform adjustment as  
follows:

Lever out large securing cap  
(on side of control unit).  
Turn CO adjusting screw until  
voltage reading fluctuates  
uniformly between 0...13 V.  
Press in new securing  
cap.



280 / 1366

- 1 = Air-flow sensor  
2 = Control unit  
3 = Anti-tamper cap for  
CO adjusting screw

Return to trouble-shooting chart  
B03



# TROUBLE-SHOOTING PROGRAM ( 1 )

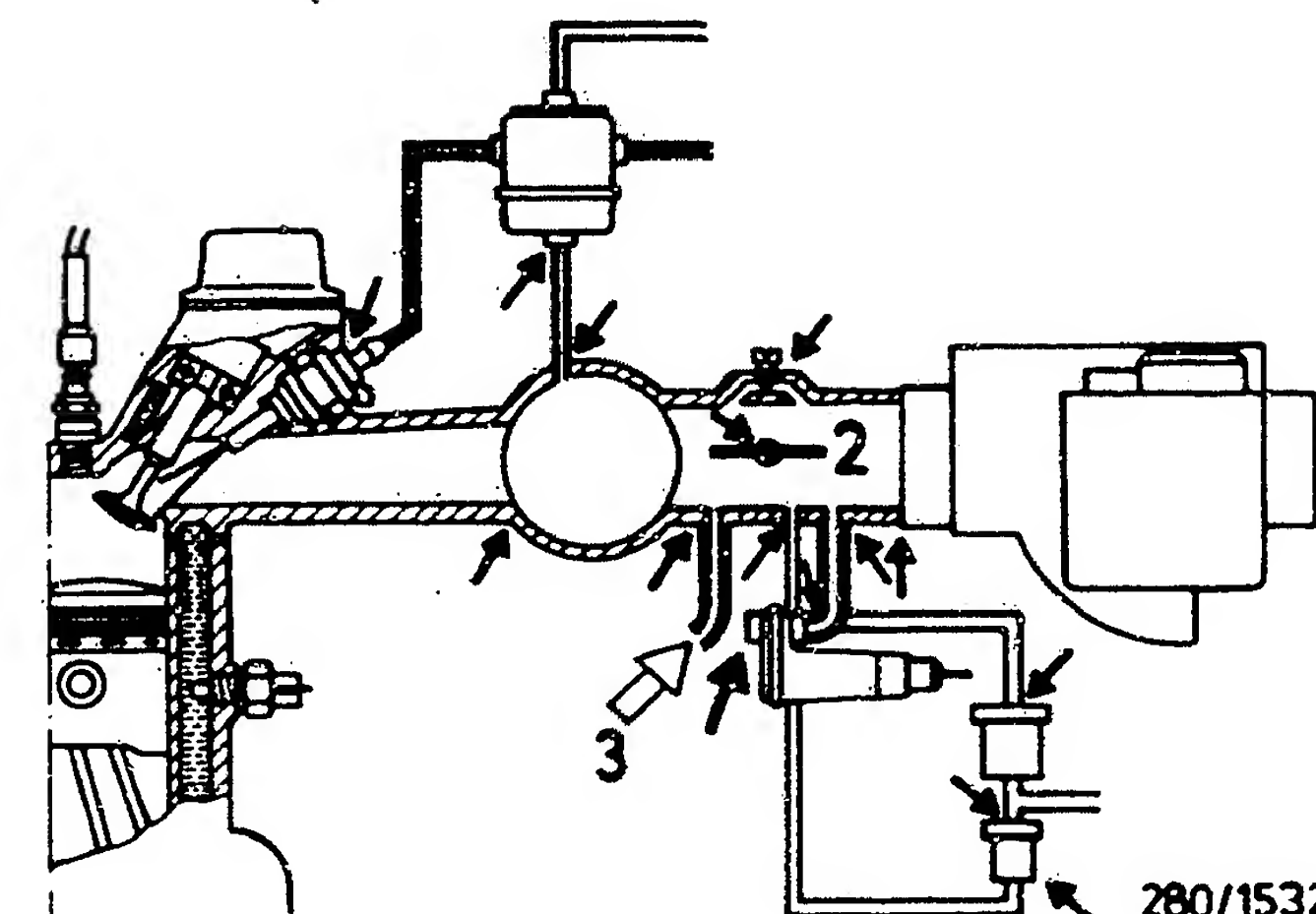
Check air-intake system

Are all hoses correctly connected, not kinked or damaged?  
Is oil dipstick pressed all the way in? Is lid seal on oil filler neck O.K.?

Are all hoses O.K.?

Replace hoses if necessary.  
Re-tighten hose binders.

Push in oil dipstick firmly.  
Replace lid seal on oil filler neck.



1 = Sealing  
2 = Open throttle valve fully  
3 = Blow in air  
Small arrows = Possible leaks

Leak test

Seal off exhaust tail pipe.  
Unscrew air-flow sensor from air-filter housing and seal off air-flow sensor duct.  
Remove hose after auxiliary-air device and seal off connection port on auxiliary-air device.  
Fully open throttle valve.

Using a compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold.  
Spray or brush all joints with leak-detector spray or soapy water.

Are all joints leak-tight?

Bubbles or the formation of foam give an indication of leaks.

Eliminate leaks by using new seals or tightening tie bands.

Leaks can also occur at the following points:  
throttle-valve mount,  
intake-manifold seal,  
tank ventilation system  
and auxiliary units  
(e.g. brake booster)  
which make use of intake-manifold pressure.

Return to trouble-shooting chart B03

# TROUBLE-SHOOTING PROGRAM ( 2 )

## Test auxiliary-air device

With cold engine:  
Detach hose to auxiliary-air device. Engine speed must decrease.

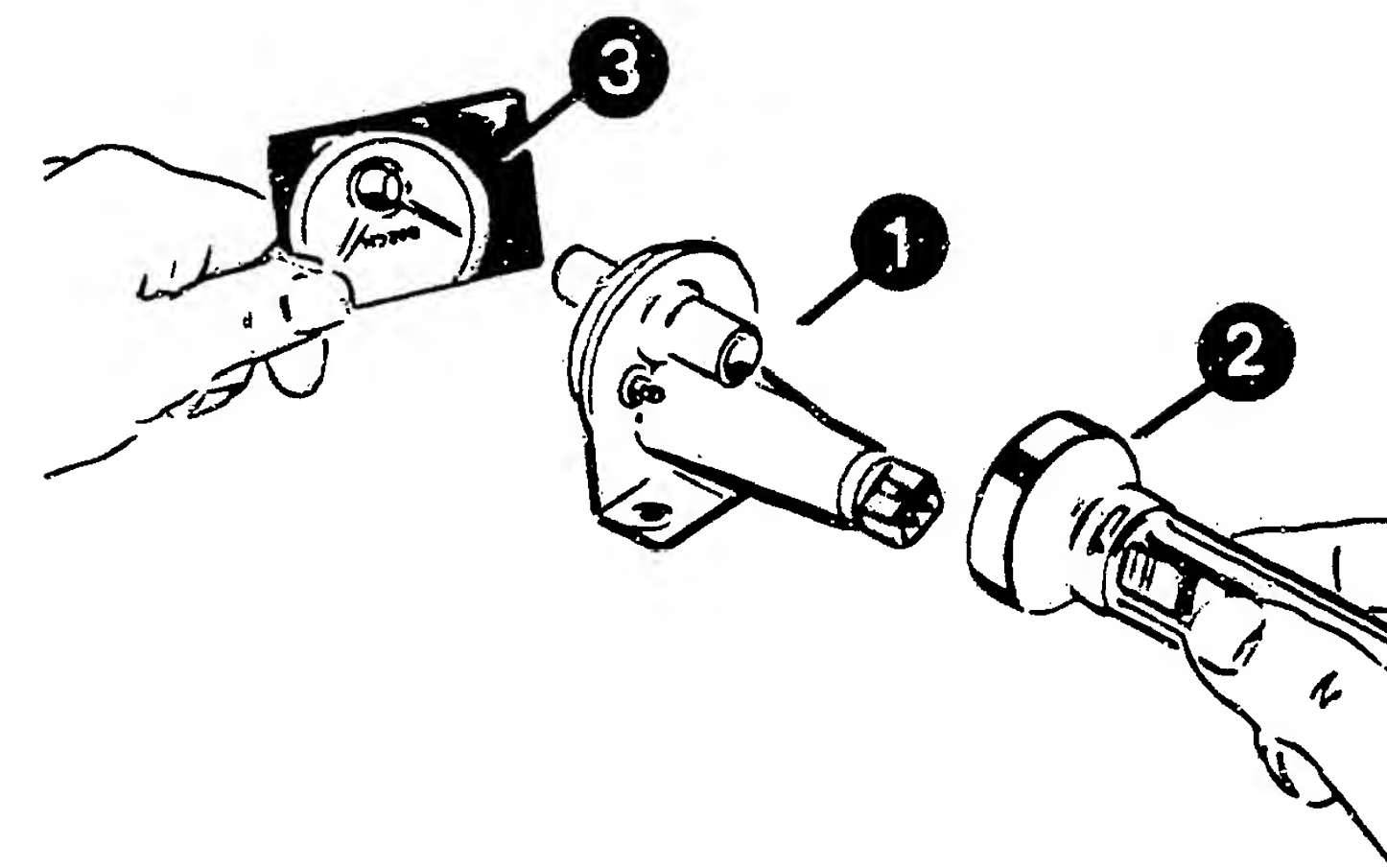
With warm engine:  
Disconnect hose. Engine speed may only drop imperceptibly.  
Take care not to damage hose.

Visual inspection: Detach hoses and inspect them using if necessary a small mirror and a lamp. With a cold engine the cross-section must be partly open, with a warm engine it must be closed.

Are functions attained?

N>

Replace auxiliary-air device



438 / 0375

1 = Auxiliary-air device  
2 = Hand lamp  
3 = Mirror

Disconnect connector from auxiliary-air device.  
Measure resistance directly at auxiliary-air device  
Set value: see brief instructions

Set value obtained?

N>

Replace auxiliary-air device

After testing is finished

Connect hoses on auxiliary-air device.  
Make sure there are no leaks.

Connect connector on auxiliary-air device.

Return to trouble-shooting chart B03

# TROUBLE-SHOOTING PROGRAM ( 3 )

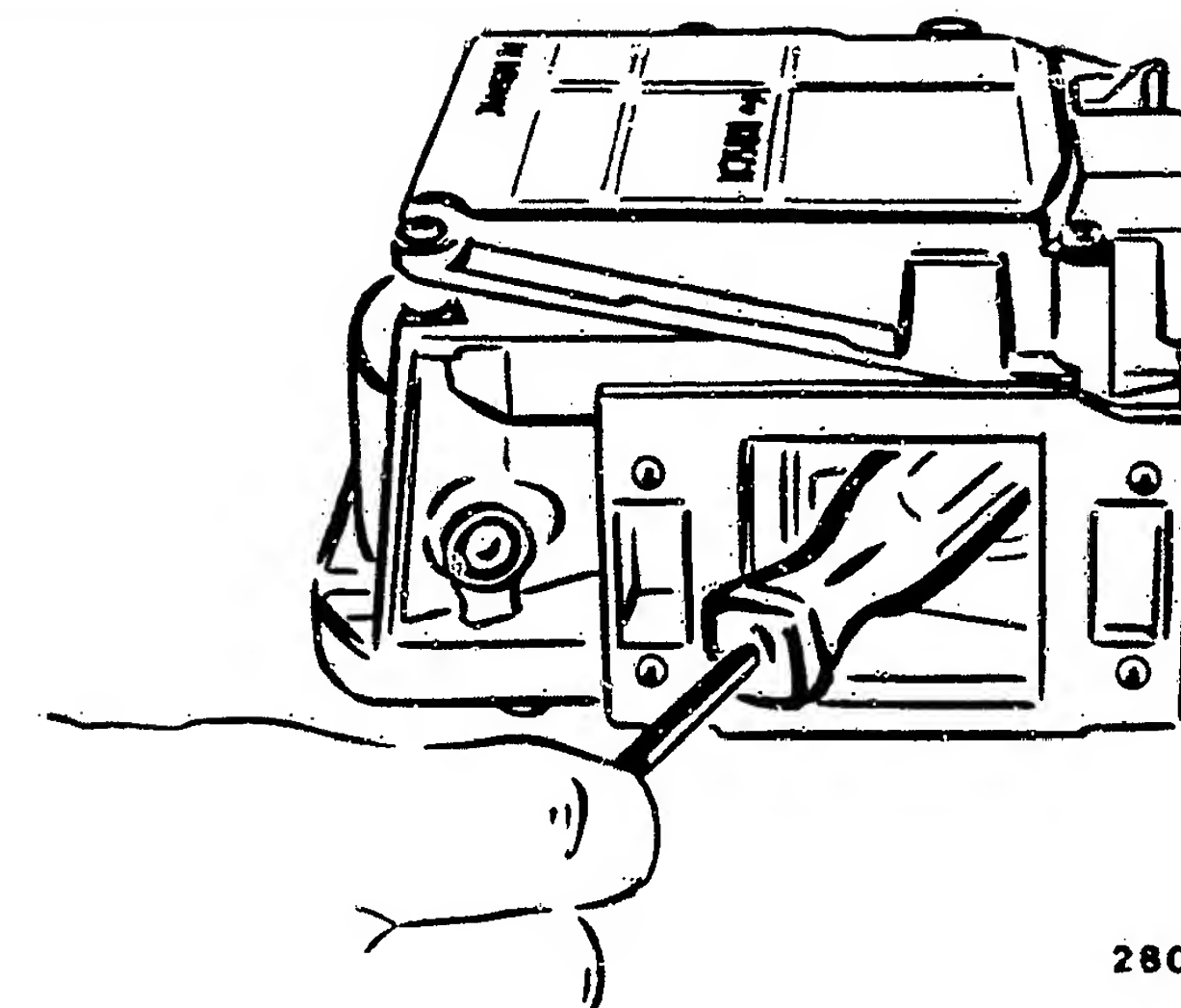
Check air-flow sensor for freedom of movement

Unlatch 15-pin plug and remove. Remove measuring and control unit from air-filter housing and loosen air hose. It must be possible for the air-flow sensor flap to be moved with uniform ease from stop to stop; when released, the flap must close again by itself.

Sensor flap must not catch. Watch for signs of abrasion or rubbing. If very dirty, clean air duct with lint-free cloth.

Does air-flow sensor flap move freely?

If there are signs of rubbing visible in the housing, if air-flow sensor flap is sticking or bent => replace air-flow sensor. To do this, remove control unit for further use. See also Coordinate A19/20



280 / 1352

Deflect air-flow sensor flap

Continued on next picture page



# TROUBLE-SHOOTING PROGRAM ( 3 ) CONTINUED ( 1 )

Electrical test of air-flow sensor.

To do this, remove control unit from air-flow sensor.  
See also Coordinate A19/20

Check potentiometer:  
Connect ohmmeter to term. 3 and term. 4 of air-flow sensor.  
Set value: 500...1000  $\Omega$

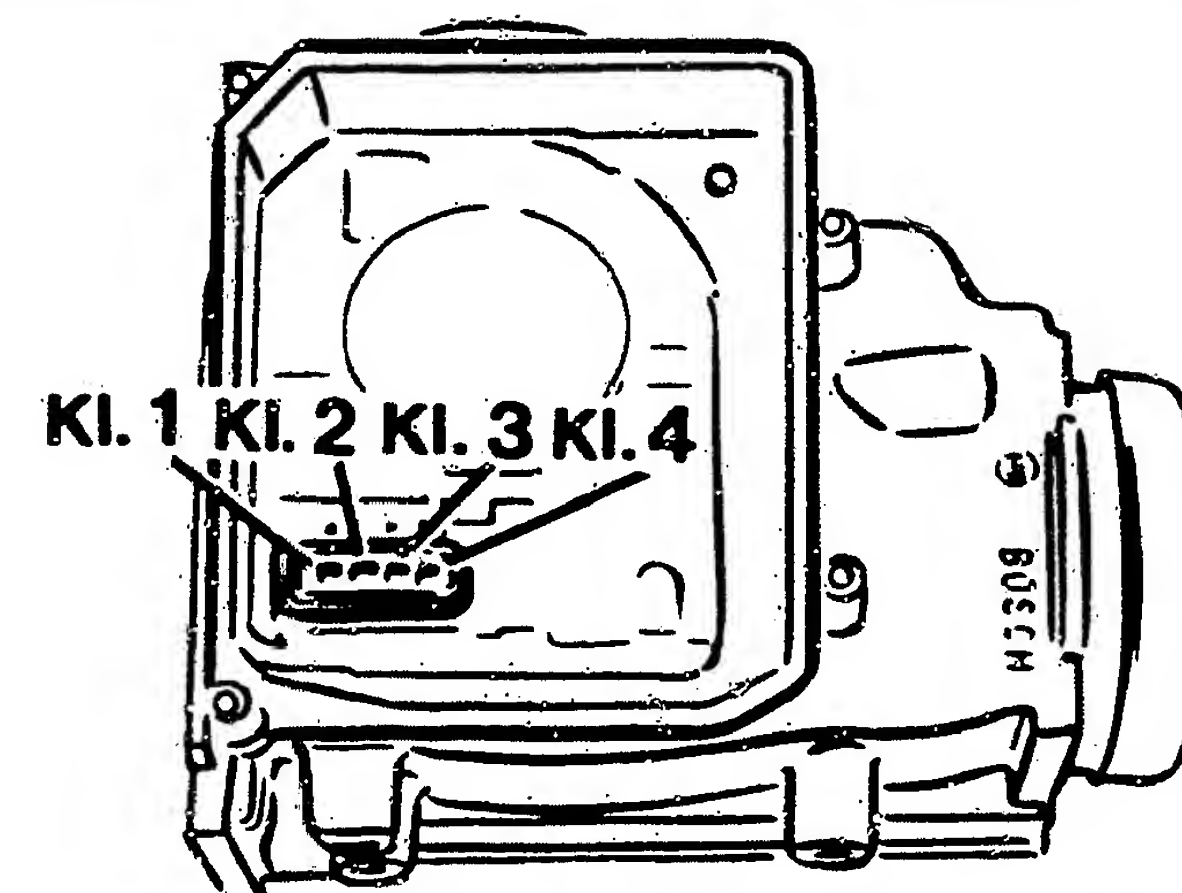
Resistance between term. 3 and term. 2, sensor flap in rest position  
Set value: 10...200  $\Omega$   
The reading must change when the sensor flap is deflected.

Check temperature sensor (intake-air):  
Resistance between term. 3 and term. 1.  
Set values:  
at ambient temperature,  
+15...+30 °C: 1.45...3.3 k  $\Omega$   
with engine at operating temp.  
approx. + 80° C : 280...360  $\Omega$

Set values obtained?

N>

Potentiometer or temperature sensor (intake-air) defective  
=> replace air-flow sensor.  
To do this, remove control unit for further use.  
See also Coordinate A19/20



280 / 1349

Continued on next picture page

TROUBLE-SHOOTING PROGRAM ( 3 ) CONTINUED ( 2 )

V

Mount control unit on air-flow sensor.

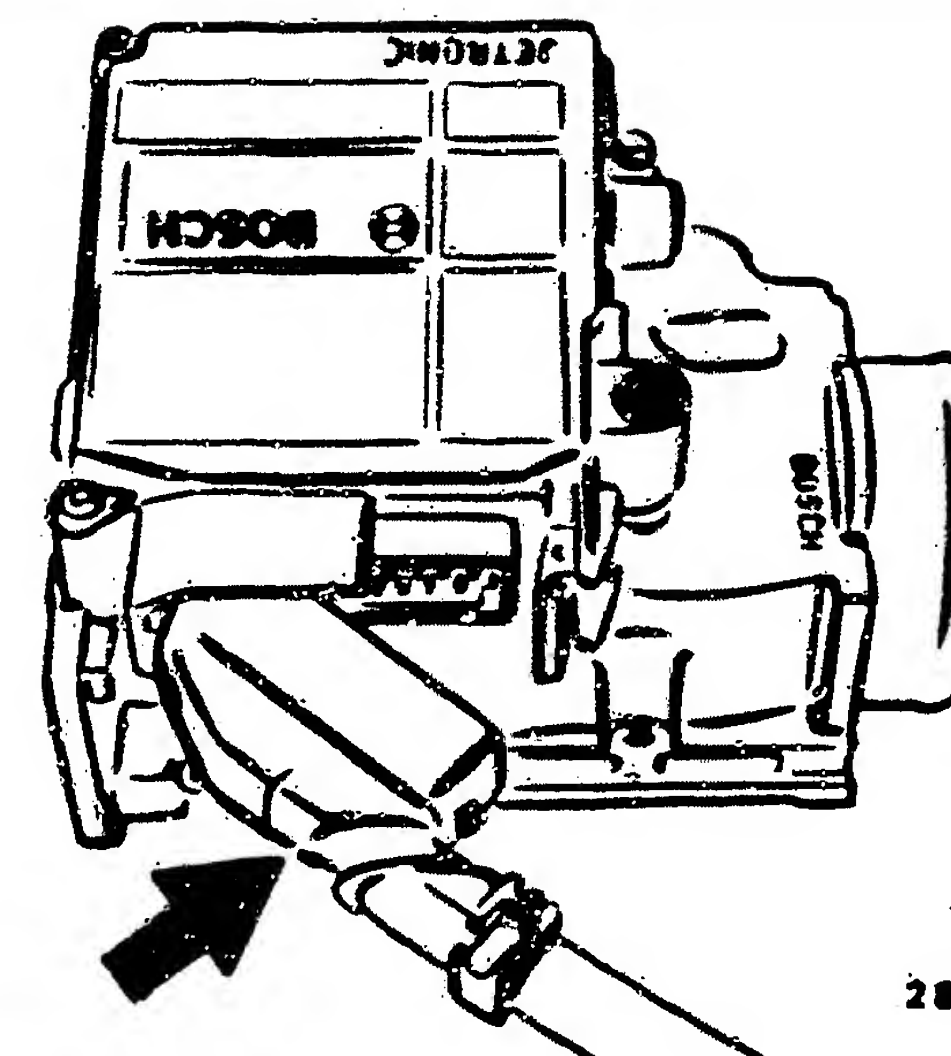
See also Coordinate A19/20

Screw measuring and control unit onto air-filter housing and mount air-guide hose. Connect 15-pin plug and latch in.

After installing a new air-flow sensor, perform idle adjustment. See Coordinate D25/26

V

Return to trouble-shooting chart B03



280/1353

# TROUBLE-SHOOTING PROGRAM ( 4 )

Check fuel delivery.

Measure fuel delivery of electric fuel pump against pressure. Therefore, measuring point at return, after pressure regulator.

Disconnect fuel-return hose from pressure regulator.  
Mount test hose on pressure regulator and lead into a 1.5 l measuring glass.  
Disconnect pump relay.  
Connect jumper into connection base between term. 87 and term. 30.  
The electric fuel pump must operate. Measuring time 30 sec.

Fuel delivery

SET VALUE: See brief instructions

Set value obtained?

After testing is finished:

Remove jumper and connect pump relay in connection base.

Remove test hose and mount fuel return hose on pressure regulator. Make sure there are no leaks.

Return to trouble-shooting chart B03

\*Fuel filter very dirty  
→ replace.

\*Fuel delivery line or pressure damper (if applicable) clogged → replace.

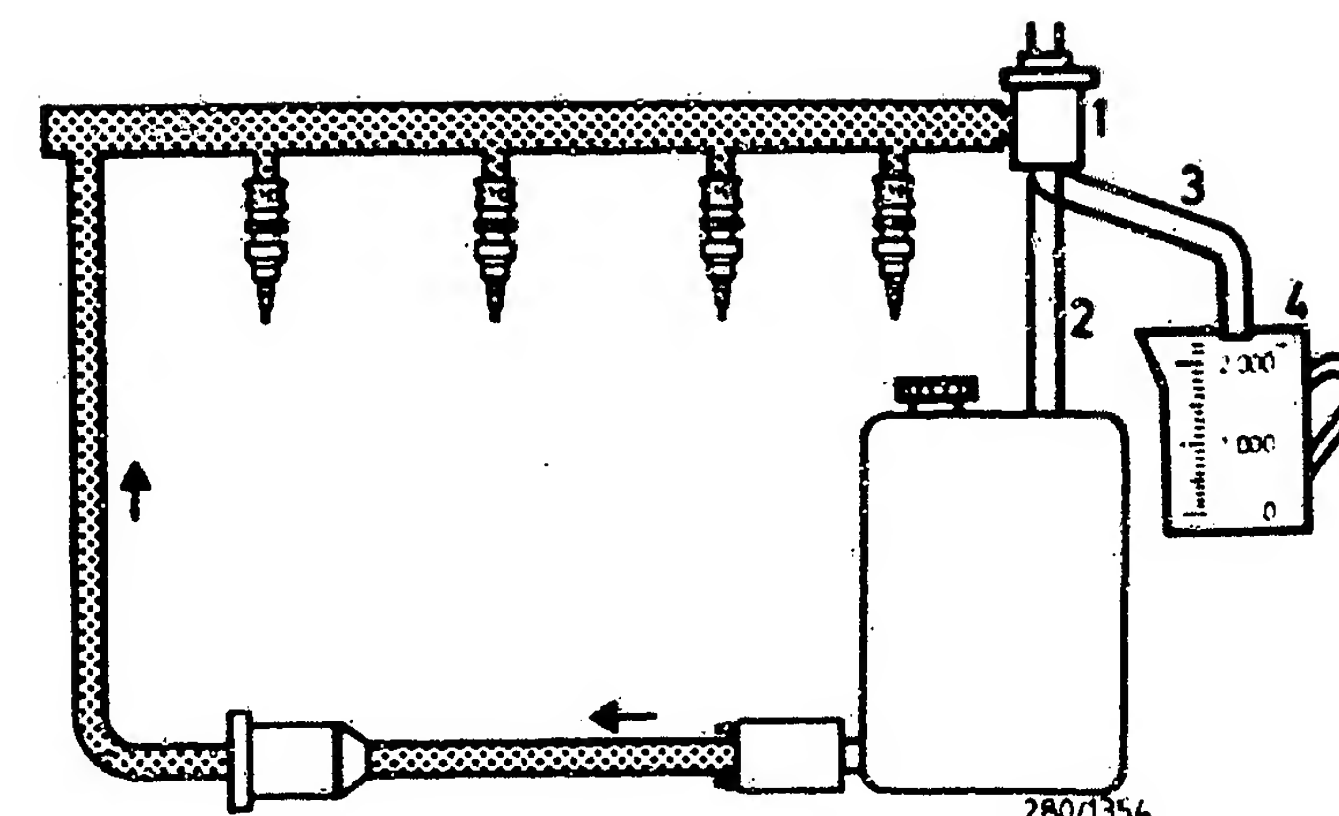
\*Voltage at electric fuel pump, with engine running, min. 12 V. If not, clean contacts, eliminate poor ground connection, replace leads.

\*Check pre-supply pump (if applicable). Measuring point: line between the pumps. Fuel delivery must be at least 10% greater than that of the electric fuel pump. If not → replace pre-supply pump.

\*If fuel-pump delivery too low → replace electric fuel pump. Clean joints before loosening so that no dirt gets into the fuel system. In-tank electric fuel pumps are accessible via a closure on the tank.

\*If electric fuel pump loud (vapor locks) intake line constricted or kinked → replace.  
Strainer in tank clogged → replace.  
Corrosion in tank → clean/replace.

\*Pressure regulator defective - check.  
See next coordinate:



Pressureless

Fuel pressure

1 = Pressure regulator

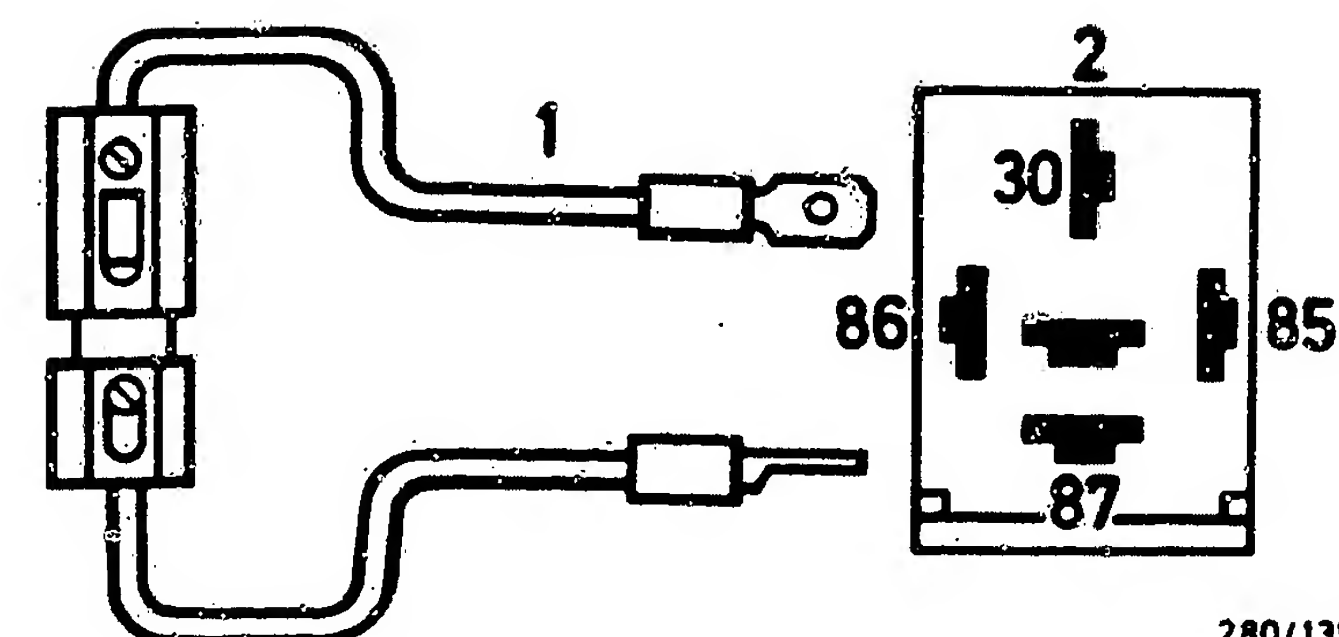
2 = Return

3 = Test hose

4 = Measuring glass

1 = Jumper with fuse holder and 10 A fuse (user-fabricated)

2 = Top view of connection base





# TROUBLE-SHOOTING PROGRAM ( 5)

Test fuel pressure with engine stopped.

N>

Measure pressure ahead of pressure regulator. Measurement point at inlet of fuel distribution pipe, at hose connection or at pressure damper (if provided)

Detach fuel supply hose.

## CAUTION!

Catch fuel as it emerges; fuel must not be allowed to get on to hot parts of engine. Connect pressure measuring device KDJE-P100, close valve screw. For connection purposes, make use of 3-way line KDJE-P100/13 (hose connection) and connection part KDJE-P100/14 (screw connection M14x1.5) or KDJE-P100/16 (screw connection M16x1.5). Make sure connection is tight.

Fit jumper between term. 87 and term. 30 in connection socket (for pump relay). Electric fuel pump must run.

Fuel pressure  
SET VALUE: See brief instructions

Is set value attained?

Y

V

Continued on next picture page

Set value is not reached:

Slowly pinch off fuel return line.  
Caution! Do not increase pressure to in excess of 6 bar.

\*If pressure increases to in excess of 5 bar → renew pressure regulator.  
Use new O-rings with O-ring sealing technique. Lubricate with a small quantity of engine oil (e.g. HD 30).

Pressure does not increase sufficiently:

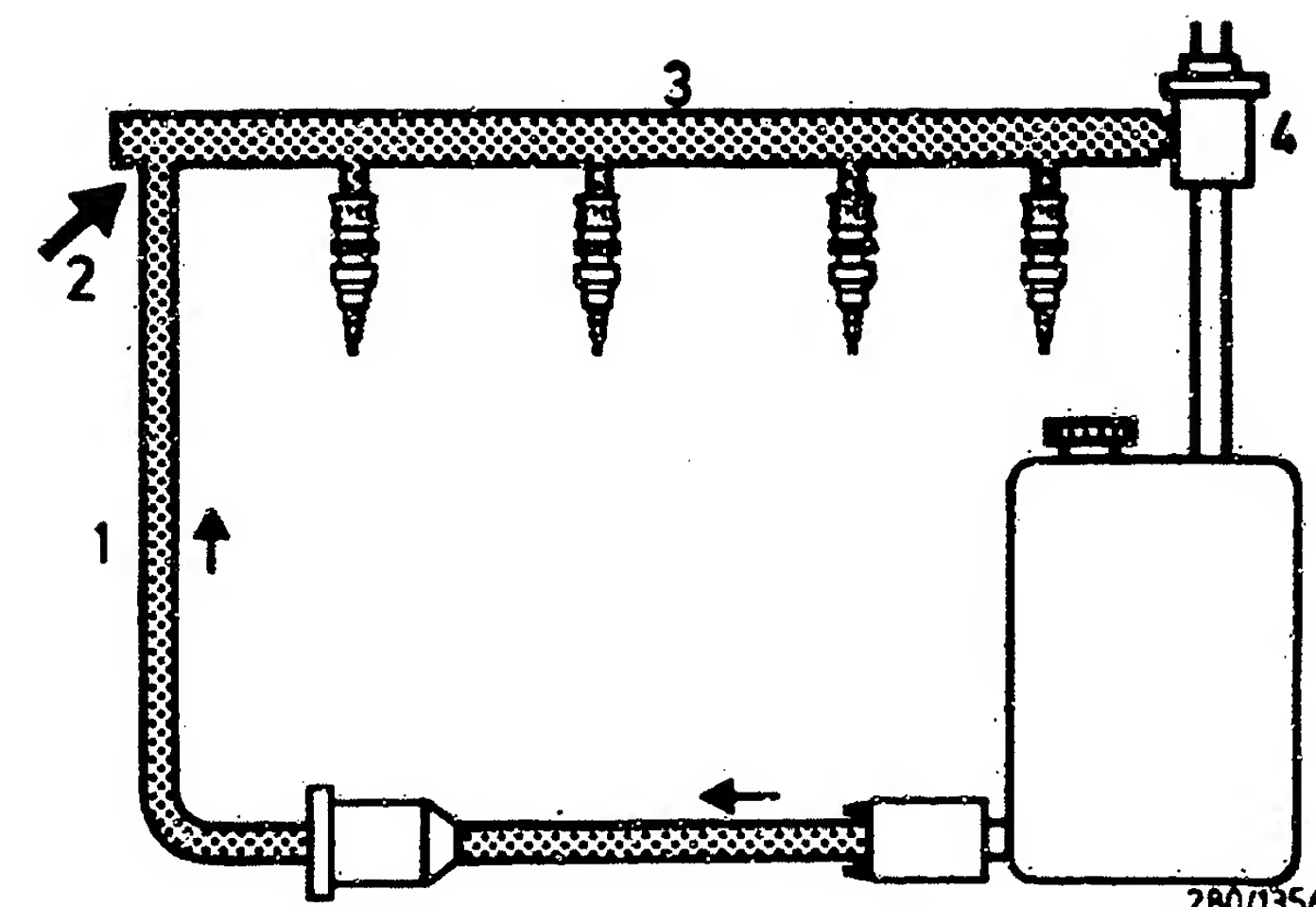
\*Fuel filter heavily clogged, renew.  
\*Fuel delivery line or pressure damper (if provided) clogged → renew.  
\*Electric fuel pump defective → renew.  
\*Strainer in tank clogged.  
Corrosion in tank.

Set value exceeded:

Detach fuel return hose from pressure regulator. Attach test hose to pressure regulator and route it into a 1.5 l measuring jug.

Is set value now attained?

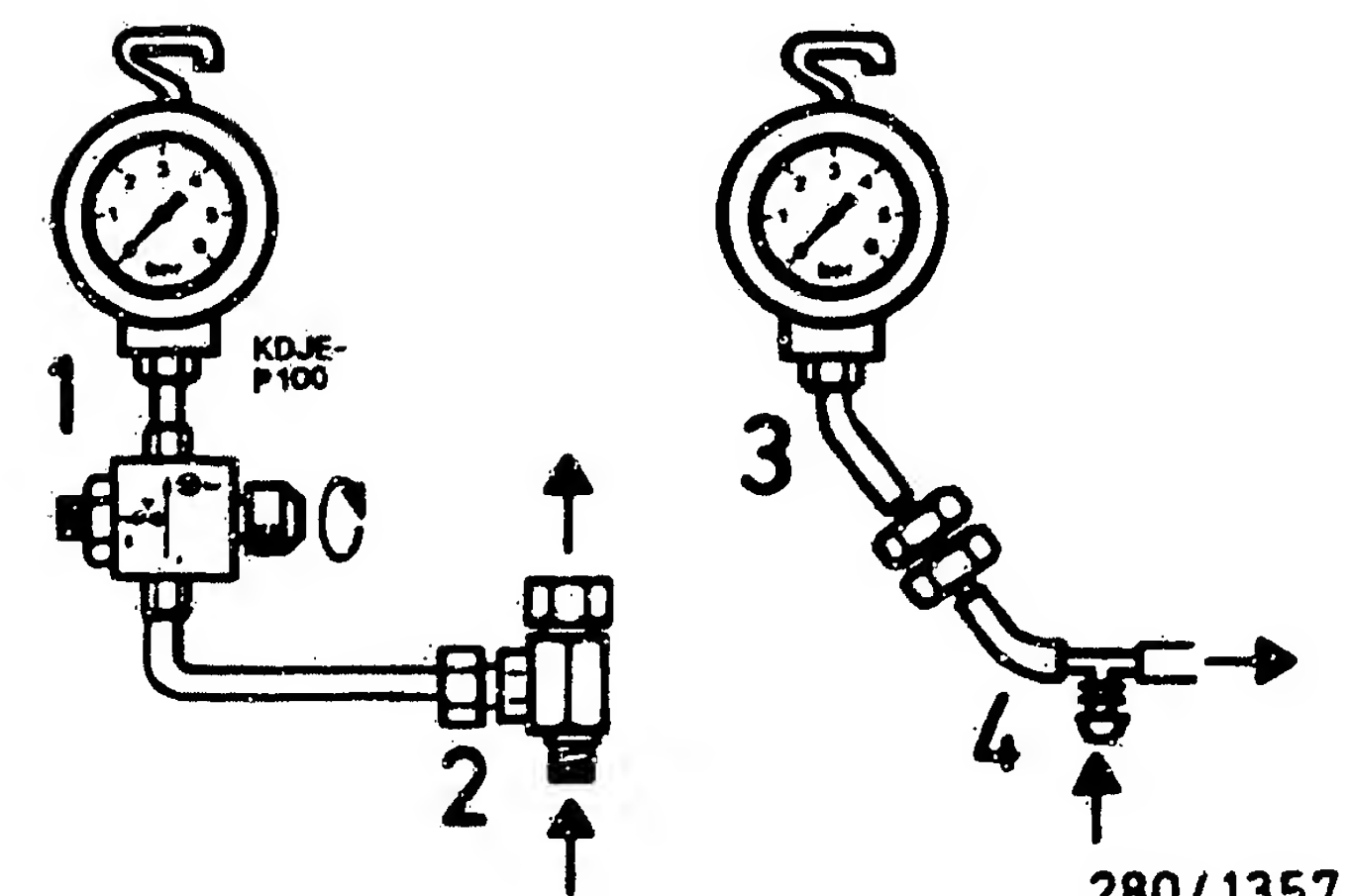
\*If yes, fuel return line clogged or crushed → renew.  
\*If not, pressure regulator defective → renew.



Pressureless

Fuel pressure

1 = Inlet, delivery line  
2 = Measuring point  
3 = Fuel-distribution pipe  
4 = Pressure regulator  
1 = Pressure tester  
2 = Connec. part KDJE-P100/14  
3 = Pressure gauge with hose line  
4 = Three-way line KDJE-P100/13



# TROUBLE-SHOOTING PROGRAM ( 5) CONTINUED ( 1)

Check fuel pressure with engine running.

Let engine idle.

Fuel pressure  
SET VALUE: approx. 0.5 bar  
lower than with engine stopped.

Set value obtained?

N>

\*Intake-manifold-pressure energization of pressure regulator not O.K. Hose line between pressure regulator and intake manifold clogged or leaking -> replace.  
Hose line dropped off -> re-connect.

\*If intake-manifold-pressure energization O.K. -> replace pressure regulator.

Check fuel pressure after switching off engine (checking for leaks).

Fuel pressure  
SET VALUE: min. 1.0 bar  
after 20 minutes.

Set value obtained?

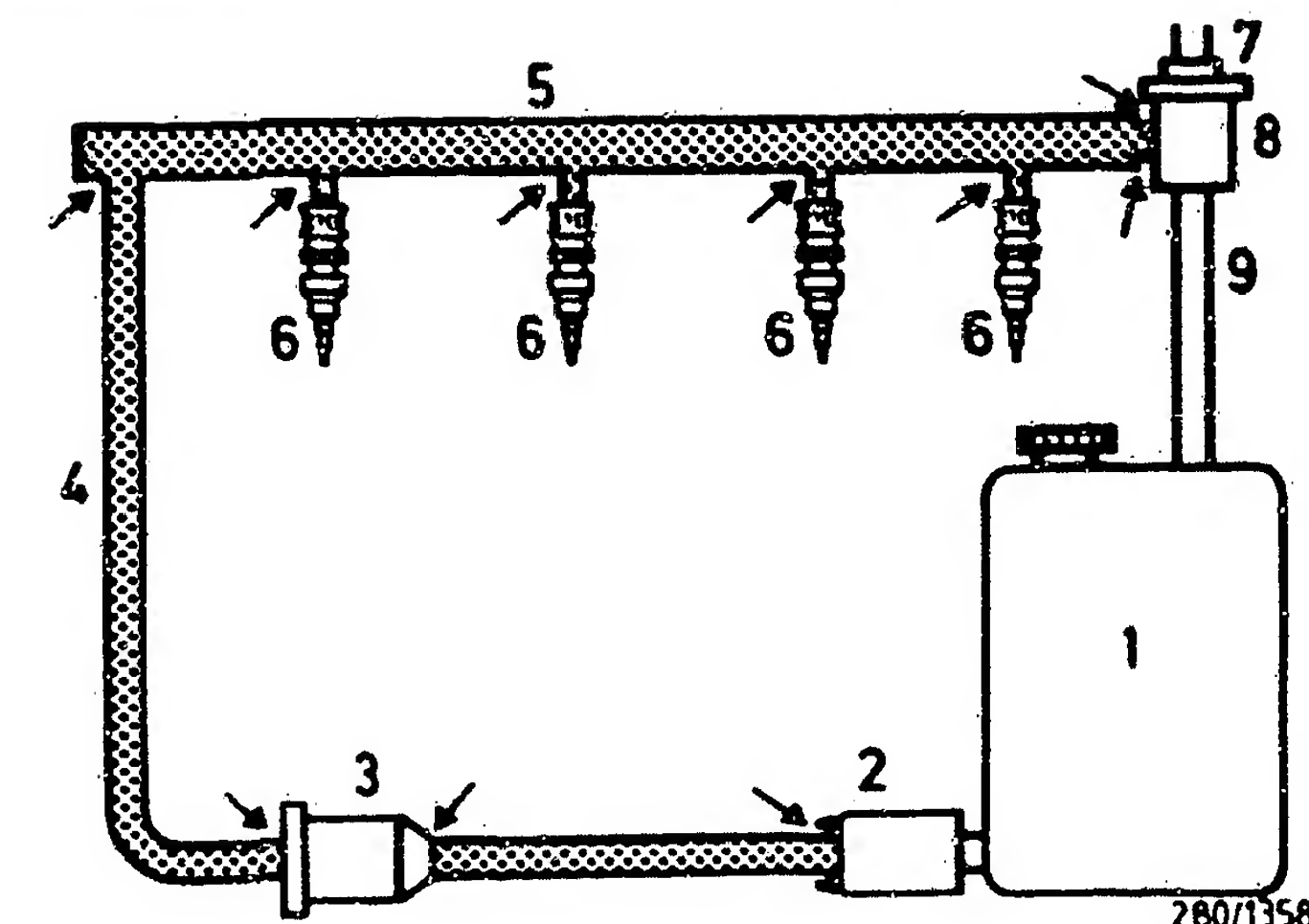
N>

\*Leaking at joints between components, fuel hoses and fuel lines -> tighten hose binder or replace hose.

\*Pressure regulator (diaphragm) leaking -> replace.

\*Electric fuel pump (non-return valve) leaking.  
With screw-type non-return valve -> replace.  
With integral non-return valve -> replace electric fuel pump.

\*Pressure damper or fuel filter leaking -> replace.



- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel filter
- 4 = Inlet, delivery line
- 5 = Fuel-distribution pipe
- 6 = Injection valves
- 7 = Intake-manifold pressure connection
- 8 = Pressure regulator
- 9 = Return line

Arrows = Possible leaks

Continued on next picture page

Continued on next picture page

\*Leak in injection valve(s)  
at point of connection with  
fuel distributor; renew  
O-ring. See text below.

\*Check injection valve(s)  
(needle seat) for leaks:

Remove complete fuel distributor.  
Supply and return remain  
connected. Simultaneously  
pull all injection valves  
out of intake-manifold guide.

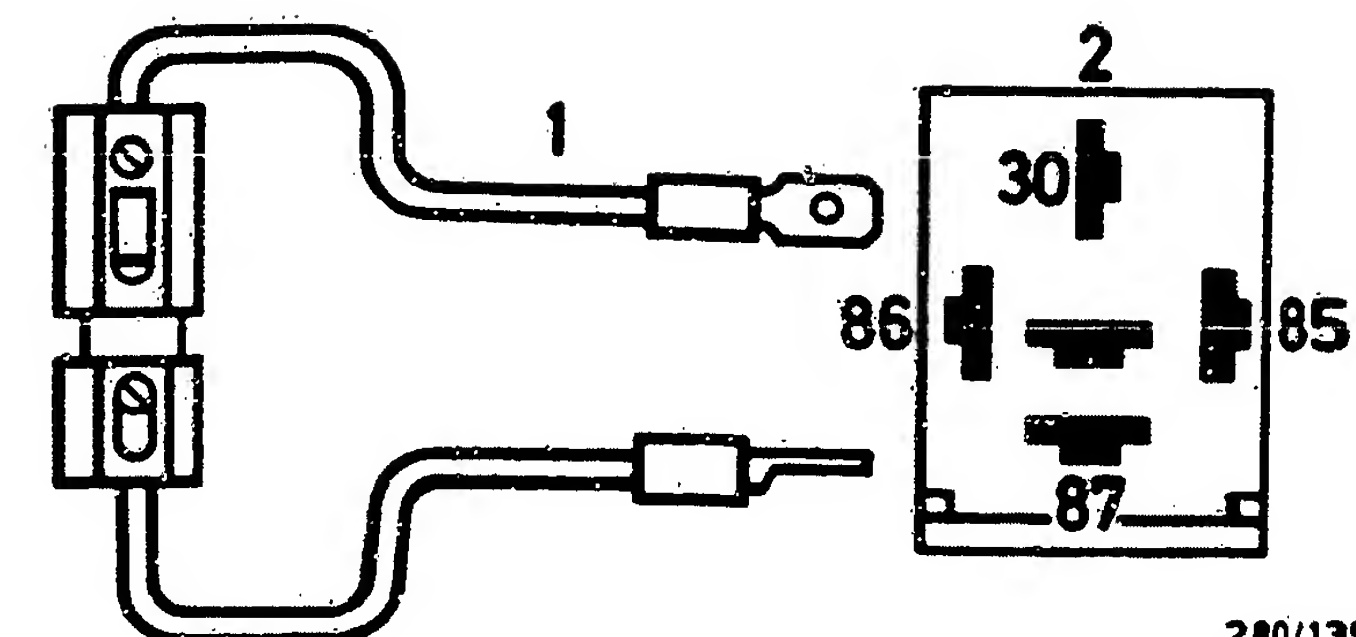
Fit jumper between term. 87  
and term. 30 in connection  
frame (pump relay).  
Electric fuel pump must  
run.

Set value:

No droplets may drip off the  
injection valve within 60 s.  
If they do so, renew injection  
valve.

Removal:

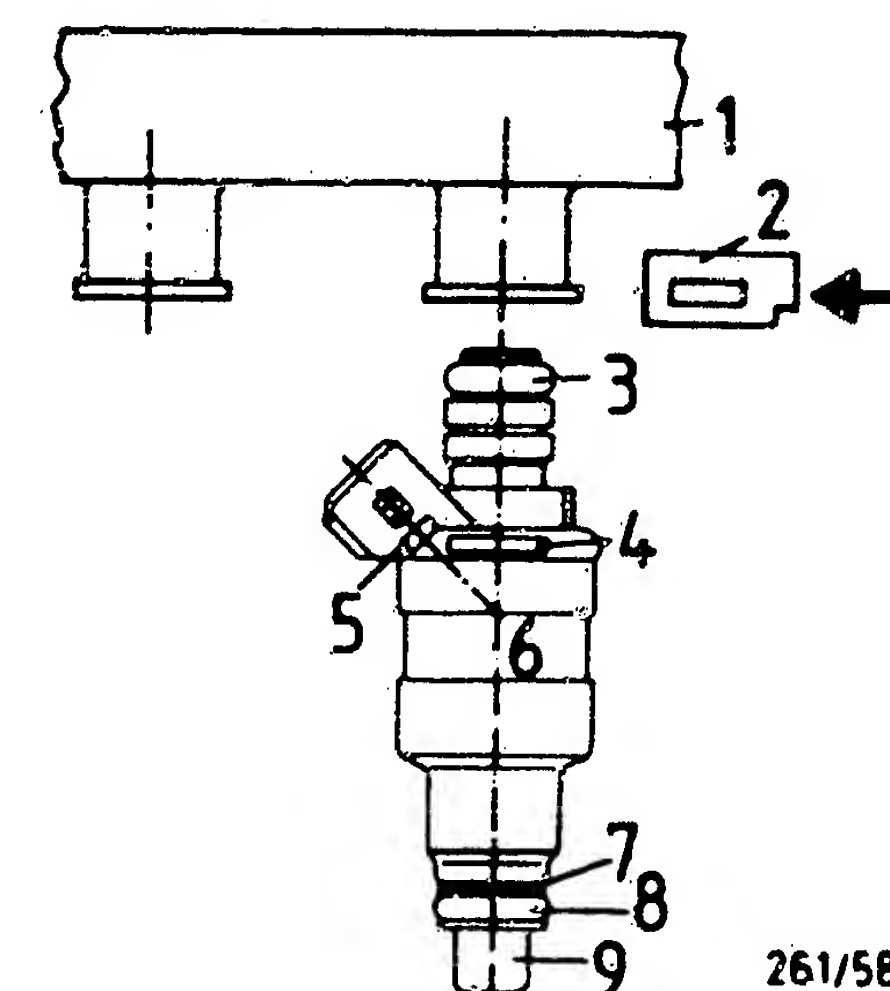
Detach connector.  
Pull out retaining clip.  
Remove injection valve.  
Caution!  
Catch any fuel which emerges.  
It must not be allowed to make  
contact with hot engine components.



280/1359

1 = Jumper with fuse holder  
and 10 A fuse (user-  
fabricated)  
2 = Top view of connection  
base

1 = Fuel-distribution pipe  
2 = Holding clamp  
3 = Upper O-ring  
4 = Part number  
5 = Date of manufacture  
6 = Injection valve  
7 = Supporting plate  
8 = Lower O-ring  
9 = Protective sleeve



261/585

Continued on next picture page

Continued on next picture page



TROUBLE-SHOOTING PROGRAM ( 5 ) CONTINUED ( 3 )

If there is no injection valve leakage (needle seat), but O-ring is defective, renew O-ring.

Use new parts set.  
Caution! Do not damage protective sleeve and valve needle

If upper O-ring (fuel distribution pipe) is damaged, renew it.

If lower O-ring (intake manifold) is defective, cut it up.  
Fit new O-ring over protective sleeve and its beading.

Fitting:  
Slightly lubricate O-rings only with engine oil (e.g. HD 30).  
Attach injection valve to fuel distribution pipe.  
Insert retaining clip into groove and engage it.  
Test for fuel leakage.  
Attach connector.

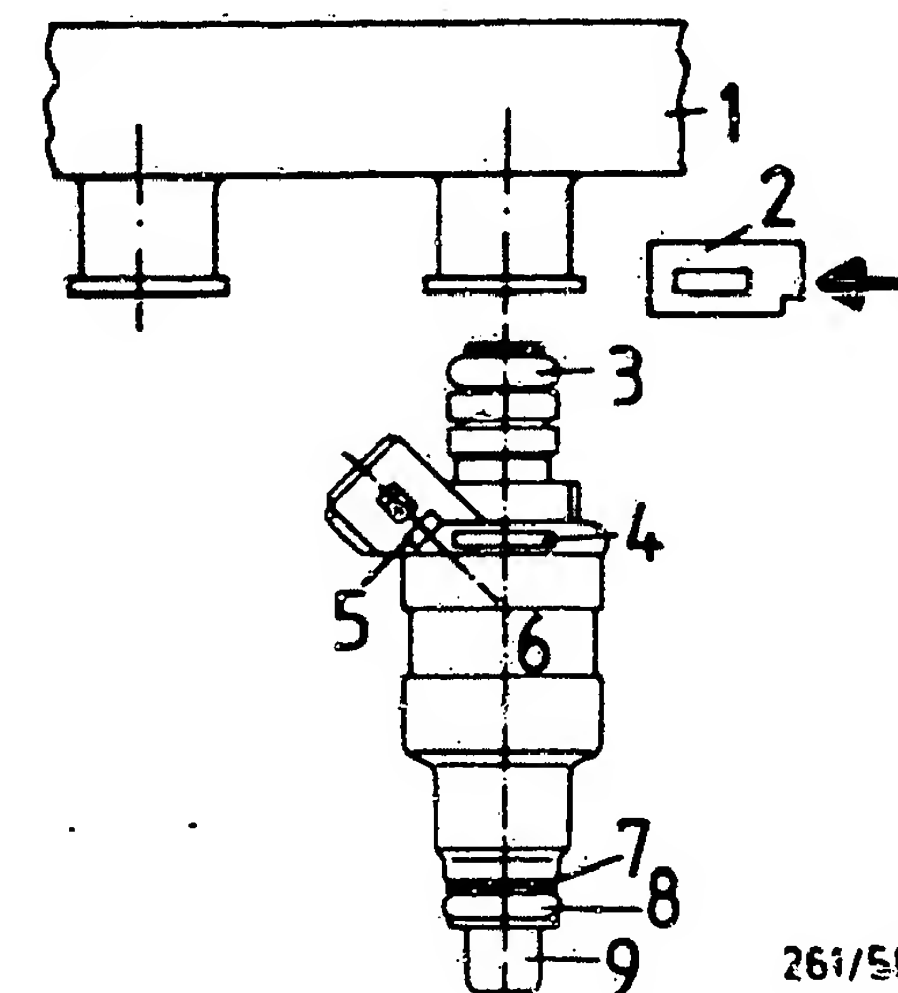
Fit complete fuel distribution pipe. In doing so, simultaneously press all injection valves into intake manifold guide.  
Important!  
Do not damage O-rings or valve needles.  
Make sure intake manifold is not leaking.

After testing is finished:

Remove jumper and connect pump relay in connection base.

Remove pressure tester.  
Connect fuel-inlet hose to fuel-distribution pipe.  
Make sure there are no leaks.

Return to trouble-shooting chart B03



261/585

- 1 = Fuel-distribution pipe
- 2 = Holding clamp
- 3 = Upper O-ring
- 4 = Part number
- 5 = Date of manufacture
- 6 = Injection valve
- 7 = Supporting plate
- 8 = Lower O-ring
- 9 = Protective sleeve

# TROUBLE-SHOOTING PROGRAM ( 6 )

Increased noise from electric fuel pump.

N>

In case of:

- high outside temperatures,
  - high fuel temperatures,
  - fuel tank almost empty,
  - lengthy full-load driving or
  - at idle,
  - use of winter fuel at warmish outside temperatures,
- vapor locks in the intake line may lead to noises at the electric fuel pump.

Are pump noises normal?

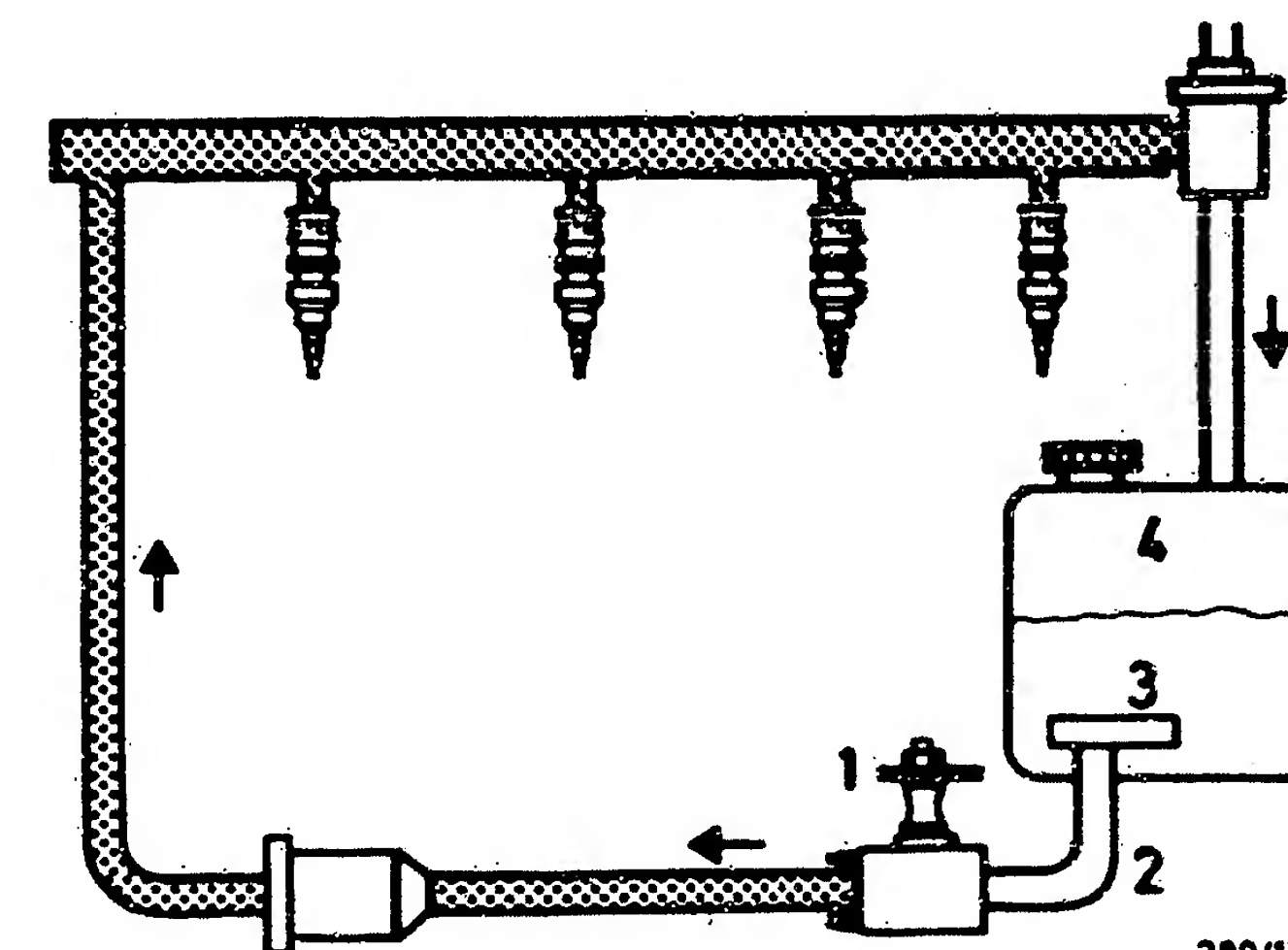
\*Pump suspension (vibration damper) defective -> replace.

\*Intake line constricted or kinked -> replace.

\*Strainer in fuel tank clogged -> replace.

\*Intake or delivery line transmitting pump noises to vehicle body -> lay lines so that they are free of tension, or replace if necessary.

\*If fuel tank almost empty -> fill up.



280/1361

- 1 = Pump mounting
- 2 = Intake line
- 3 = Intake strainer
- 4 = Fuel level

Return to trouble-shooting chart B03

# TROUBLE-SHOOTING PROGRAM ( 7 )

Check solenoid-operated injection valves with engine running.

With engine running, disconnect injection-valve connectors, individually one after the other, from the injection valves and re-connect.

Engine speed must noticeably drop if injection valve is O.K.

Set value: drop in engine speed

Set value obtained?

N>

No drop in engine speed => renew corresponding solenoid-operated injection valve.

Remove complete fuel distribution pipe.

Caution!

Catch fuel as it emerges; fuel must not be allowed to get on to hot parts of engine. Simultaneously pull all injection valves out of intake-manifold guide.

Removal:

Detach connector.

Pull out retaining clip.

Remove injection valve.

Installation:

Lubricate O-rings only with a small quantity of engine oil (e.g. HD 30).

Attach injection valve to fuel distribution pipe.

Insert retaining clip into groove and engage it.

Test for fuel leakage.

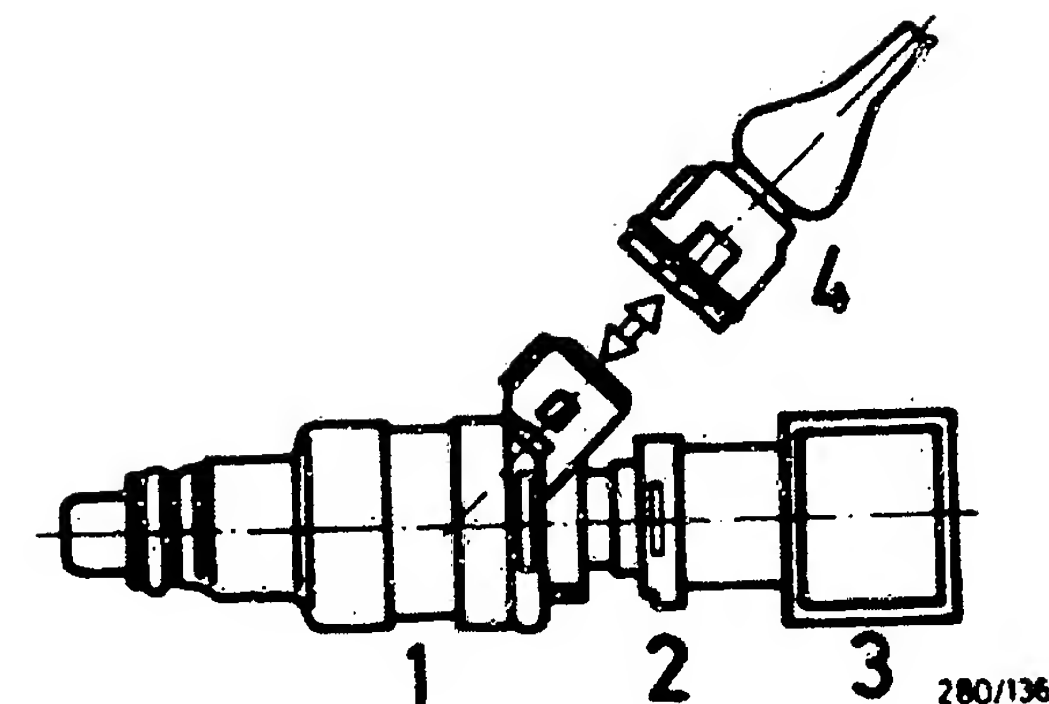
Attach connector.

Install complete fuel distribution pipe. In doing so, simultaneously press all injection valves into intake-manifold guide.

Caution!

Take care not to damage O-rings or valve needles.

Make sure there is no int.-man. leak.



1 = Injection valve

2 = Holding clamp

3 = Fuel-distribution pipe

4 = Connector

280/1362

Return to trouble-shooting chart  
B03



# TROUBLE-SHOOTING PROGRAM ( 8 )

Check interference and missing.

Connect the two-pole test lead 1 684 463 093 between an injection valve and its connector.  
Connect motortester (special input) to test lead. Black clamp to vehicle ground.  
Connect red clamp to one of the two connections of the test lead.

Caution: the free terminal of the test lead must not come into contact with ground.

Let engine run.

If correctly connected, injection pulses will be visible on the oscilloscope (diagram opposite).

Set value: injection pulses

Set value obtained?

N>

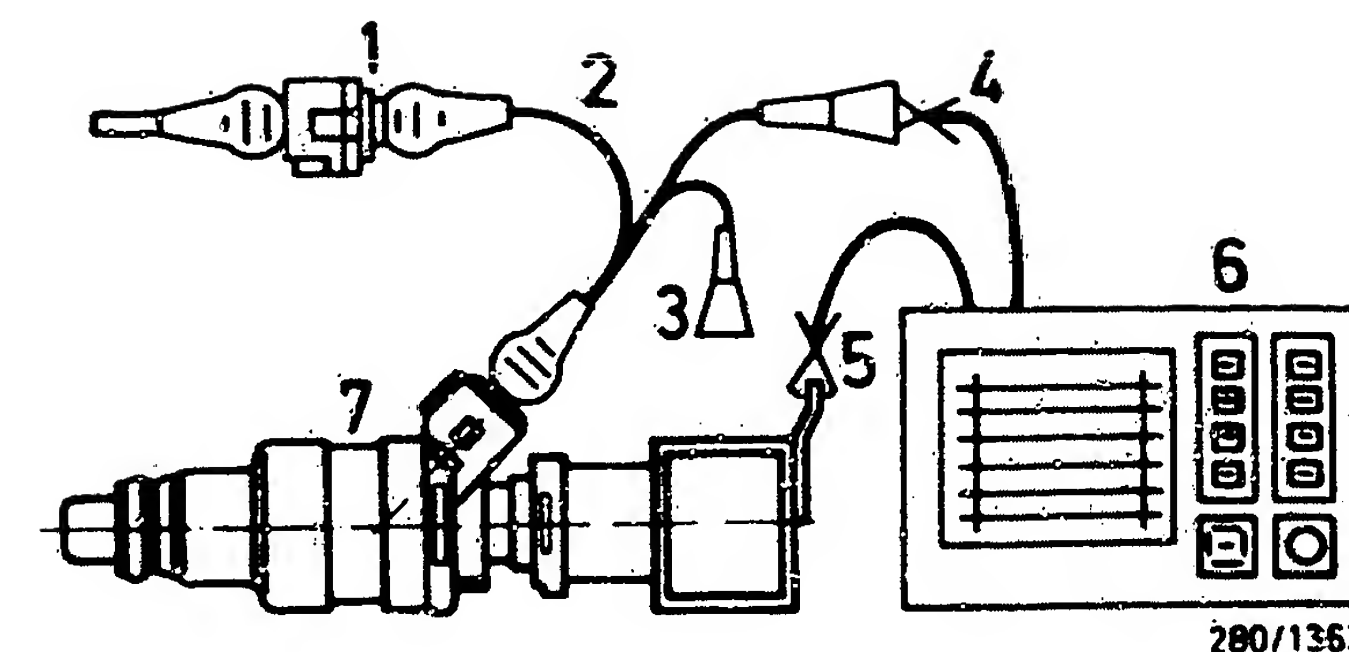
Check connections.  
Connect the red clamp from the motortester to the other connection of the test lead.

The free connection must not come into contact with ground.

If there are deviations from the set value, the other injection valves should also be examined.

In the case of interference, check the routing of the leads, i.e. ignition cables should be kept clear of the wiring harness.

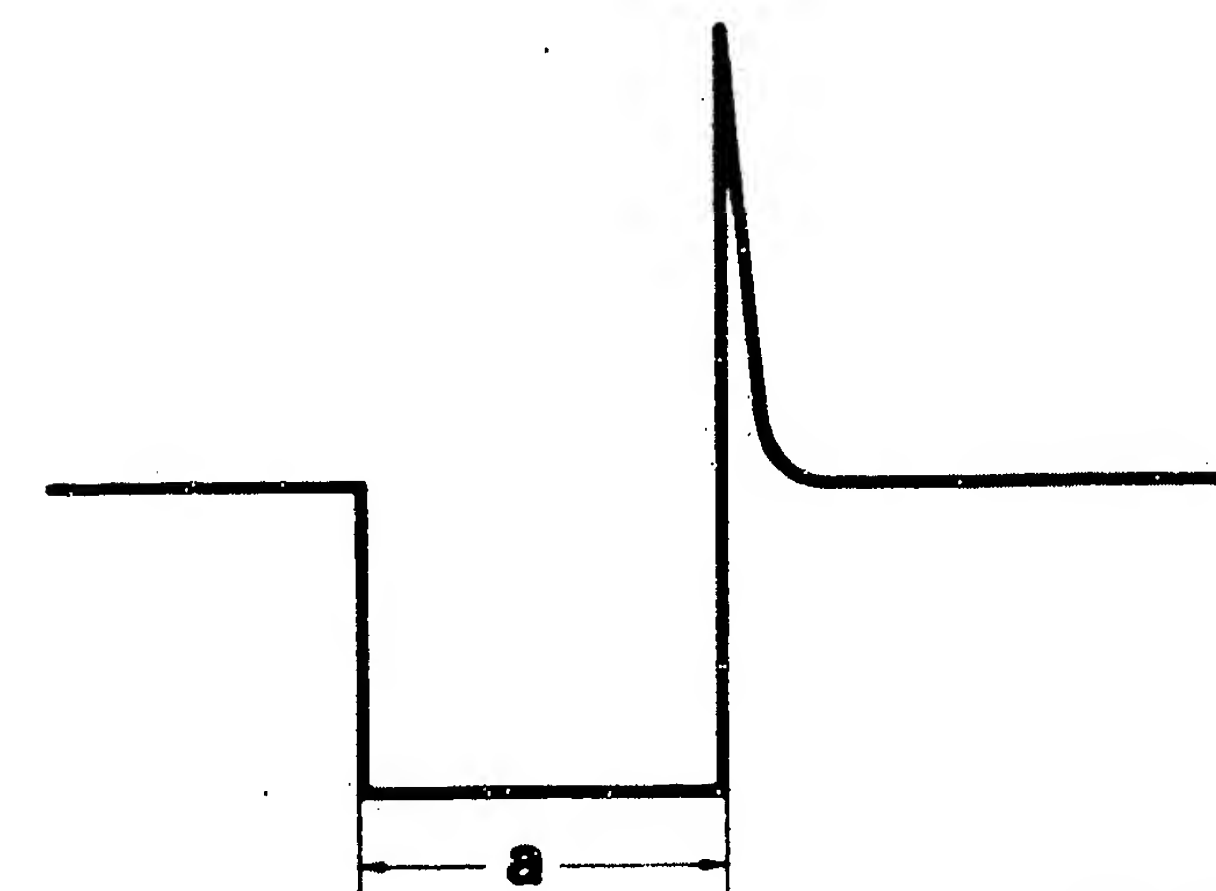
In the case of missing, check all electrical plug-in connections. Pay particular attention to positive supply, ground connection and ignition signal term. 1



- 1 = Connector
- 2 = Test lead 1 684 463 093
- 3 = Free connection
- 4 = Red clamp
- 5 = Black clamp
- 6 = Motortester
- 7 = Injection valve

Injection pulses of a switched output stage (measured at the injection valve)

a = Pulse length (dependent on engine load)



Continued on next picture page

Continued on next picture page

TROUBLE-SHOOTING PROGRAM ( 8 ) CONTINUED ( 1 )

After testing is finished:

Ignition "OFF". Disconnect  
motortester. Disconnect  
test lead from solenoid-  
operated injection valve and  
connect connector.

With engine off, remove plug  
from alternator.  
Start engine.  
If missing stops, check  
alternator and regulator.  
Voltage peaks are visisble  
on the ignition oscilloscope.

Return to trouble-shooting chart  
B03

# TROUBLE-SHOOTING PROGRAM ( 9 )

Test start control.

Detach ignition cable term. 4 from ignition distributor cap and connect to ground with 5k  $\Omega$  sleeve-type suppressor 0 356 500 001. Engine must not start.

Connect 2-pole test lead 1 684 463 093 between a solenoid-operated injection valve and its connector. Connect multimeter (preferably analog version) to free measurement terminals. Measuring range approx. 10 V. Detach connector of temperature sensor (engine) and connect 10 k  $\Omega$  resistor e.g. temperature sensor 0 280 130 028 (at 15°C...30°C 10 k  $\Omega$  ).

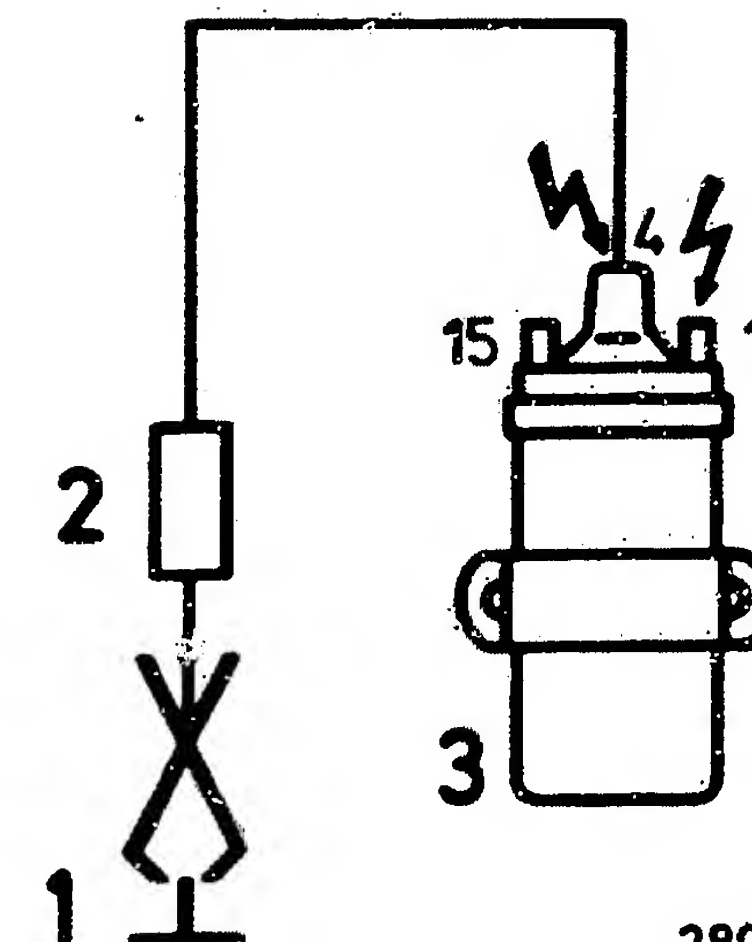
## MEASUREMENT:

Start engine.  
Set value: Voltage decreases from initially greater than 1,5 V within approx. 15 s starting time to approx. 0,3 V.  
Start repetition time longer than 1 minute.

Is set value attained?

N>

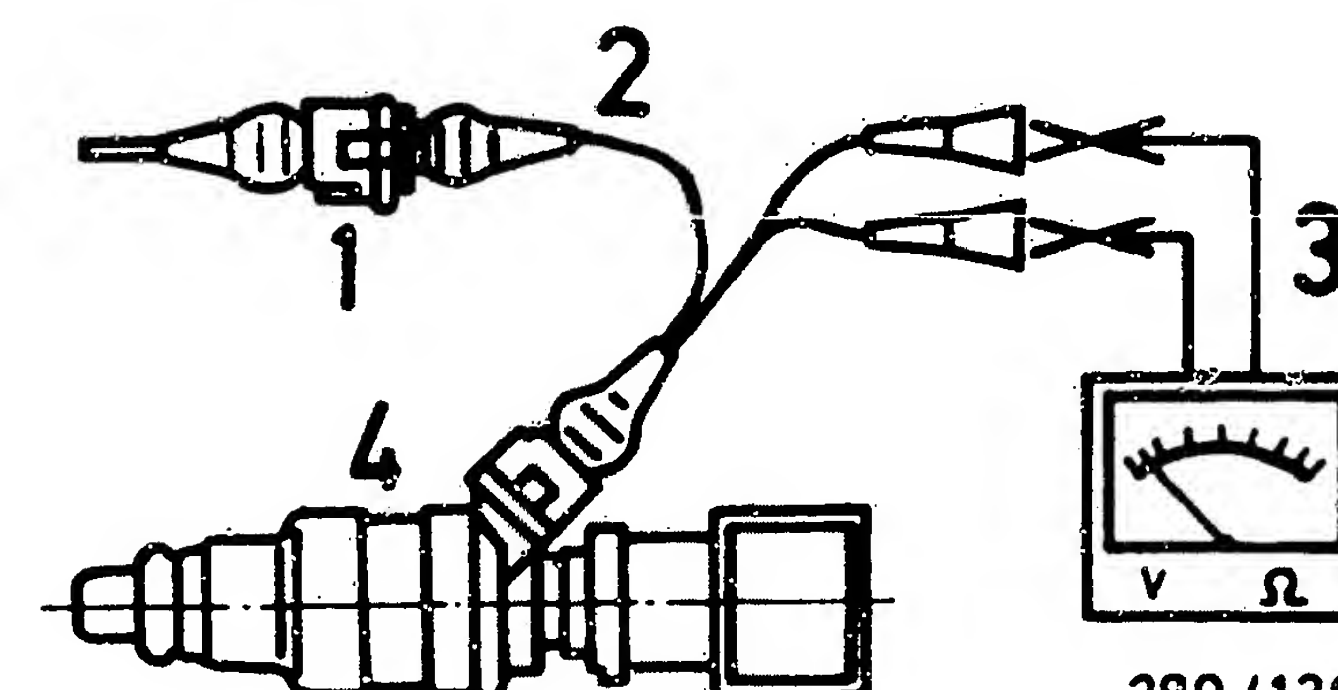
If voltage values not obtained  
=> replace control unit.



280/1534

- 1 = Ground terminal
- 2 = Sleeve-type suppressor 5 k  $\Omega$  0 356 500 001
- 3 = Ignition coil
- Caution! term. 1 and term. 4:  
hazardous voltages  
400 V - 25 kV.

- 1 = Connector from vehicle wiring harness
- 2 = Test lead 1 684 463 093
- 3 = Multimeter
- 4 = Injection valve



280/1364

Return to trouble-shooting chart B03



# TROUBLE-SHOOTING PROGRAM (10)

Check overrun cutoff

Connect the two-pole test lead 1 684 463 093 between a solenoid-operated injection valve and its connector.  
Connect motortester (special input) to test lead. Black clamp to vehicle ground.  
Connect red clamp to one of the two connections of the test lead.

Caution: the free connection of the test lead must not come into contact with ground.

Let engine run.

If correctly connected, injection pulses will be visible on the oscilloscope (diagram opposite).

Set value: injection pulses

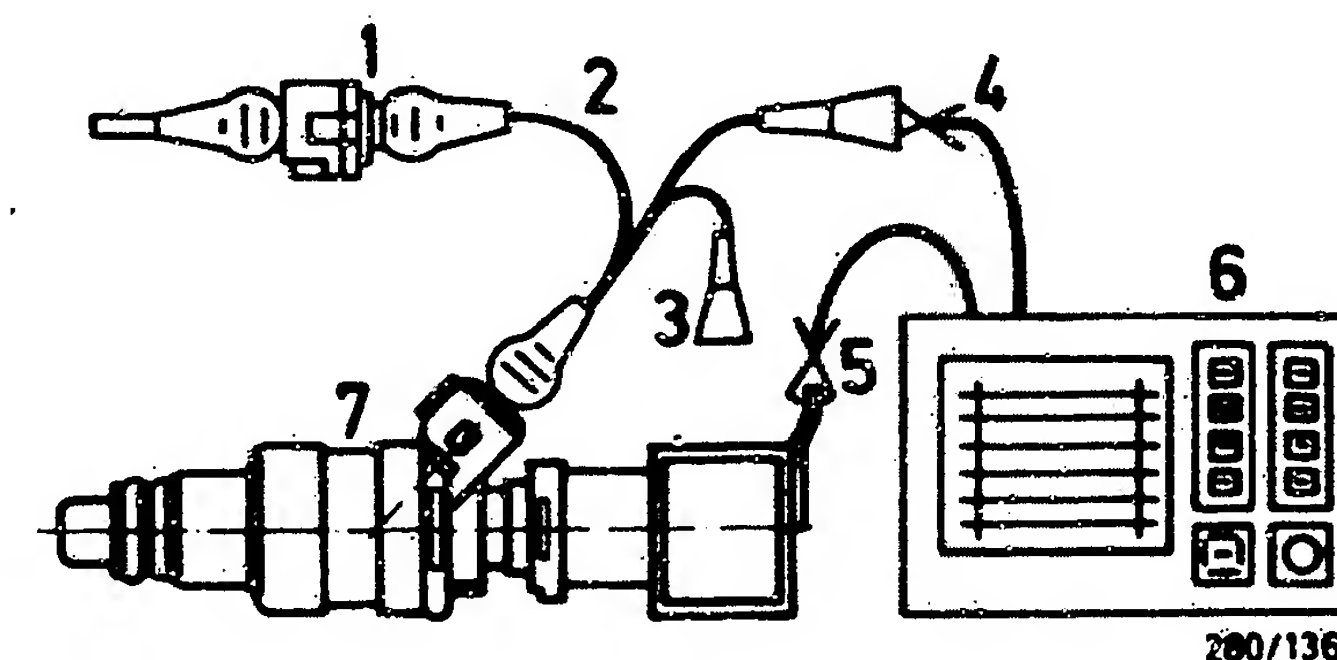
Set value obtained?

N>

Check connections.

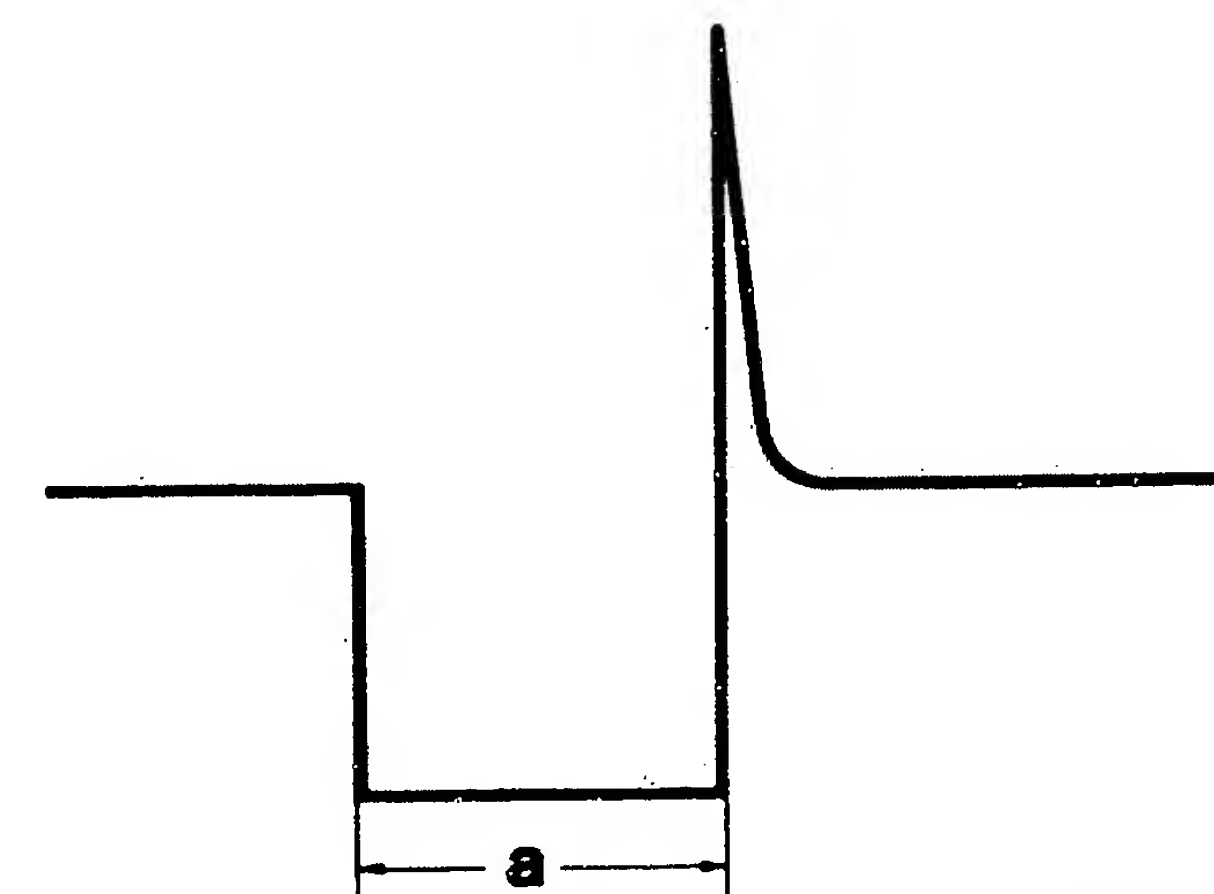
Connect the red clamp from the motortester to the other connection of the test lead.

The free connection must not come into contact with ground.



- 1 = Connector
- 2 = Test lead 1 684 463 093
- 3 = Free connection
- 4 = Red clamp
- 5 = Black clamp
- 6 = Motortester
- 7 = Injection valve

Injection pulses of a switched output stage (measured at the injection valve)  
a = Pulse length (dependent on engine load)



Continued on next picture page

280/0249

# TROUBLE-SHOOTING PROGRAM (10) CONTINUED ( 1)

Slowly increase engine speed to approx. 3000 min<sup>-1</sup>. Injection pulses must be visible on oscilloscope. Take foot off accelerator pedal (idle position). Injection pulses no longer present.

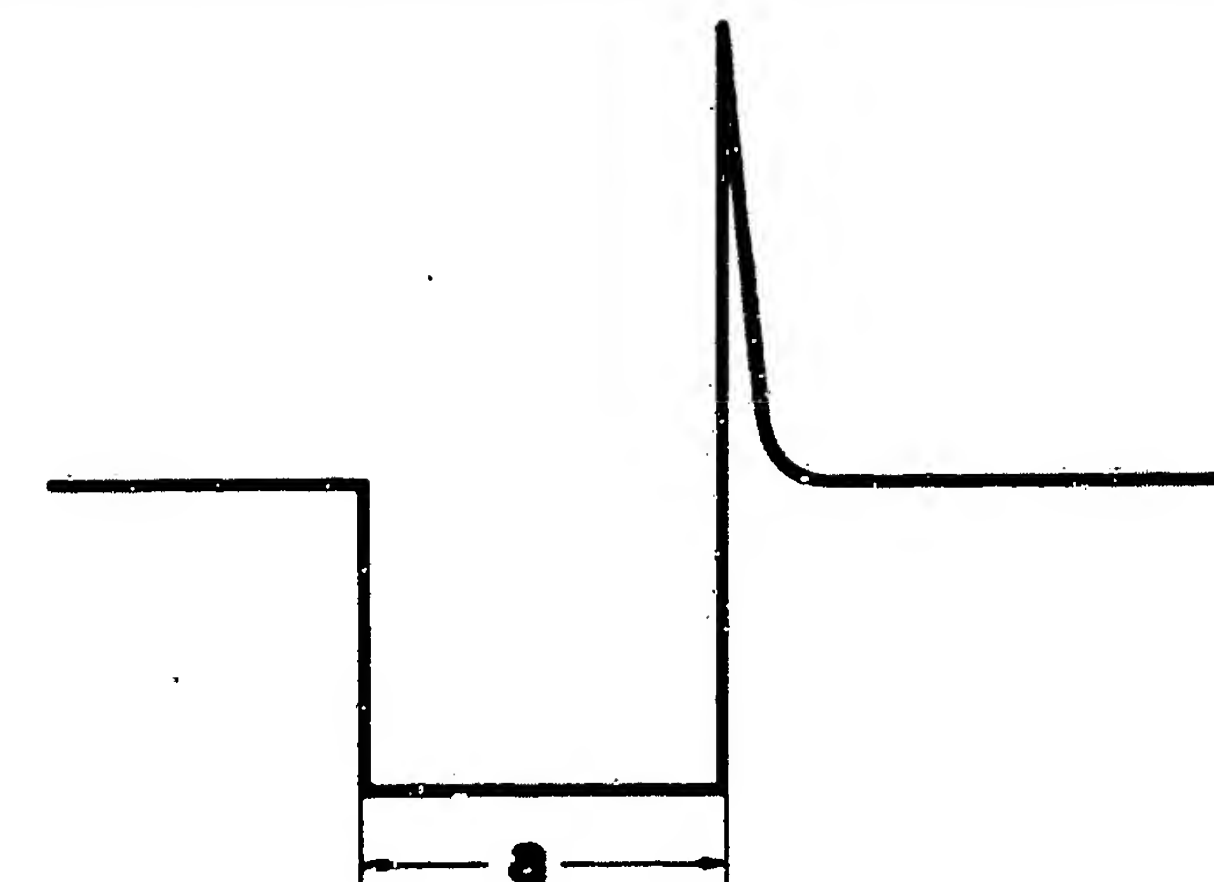
Set value:  
With decreasing engine speed, injection pulses cut in again above idle speed.

Is set value attained?

N>

Make sure that the idle switch has been correctly adjusted and is in proper working order.

If this is the case => replace control unit.



280/0249

Injection pulses of a switched output stage (measured at the injection valve)  
a = Pulse length (dependent on engine load)

After testing is finished:

Ignition "OFF". Disconnect motortester. Disconnect test lead from solenoid-operated injection valve and connect connector.

Return to trouble-shooting chart B03

# TROUBLE-SHOOTING PROGRAM (11)

V

Check idle speed

N>

Adjust idle speed at bypass  
screw on throttle-valve  
assembly.

## Requirement:

- \*Air-intake system leak-tight.
- \*Air filter not clogged.
- \*Auxiliary-air device leak-tight
- \*Throttle lever resting on stop.
- \*Throttle cable/linkage adjusted free of tension.

\*Ignition and valve gear O.K.

## Conditions:

- \*Engine at operating temperature, approx. +80°C
- \*Air conditioner off.

Set value: see brief instructions

Set value obtained?

Y

V

Test CO content

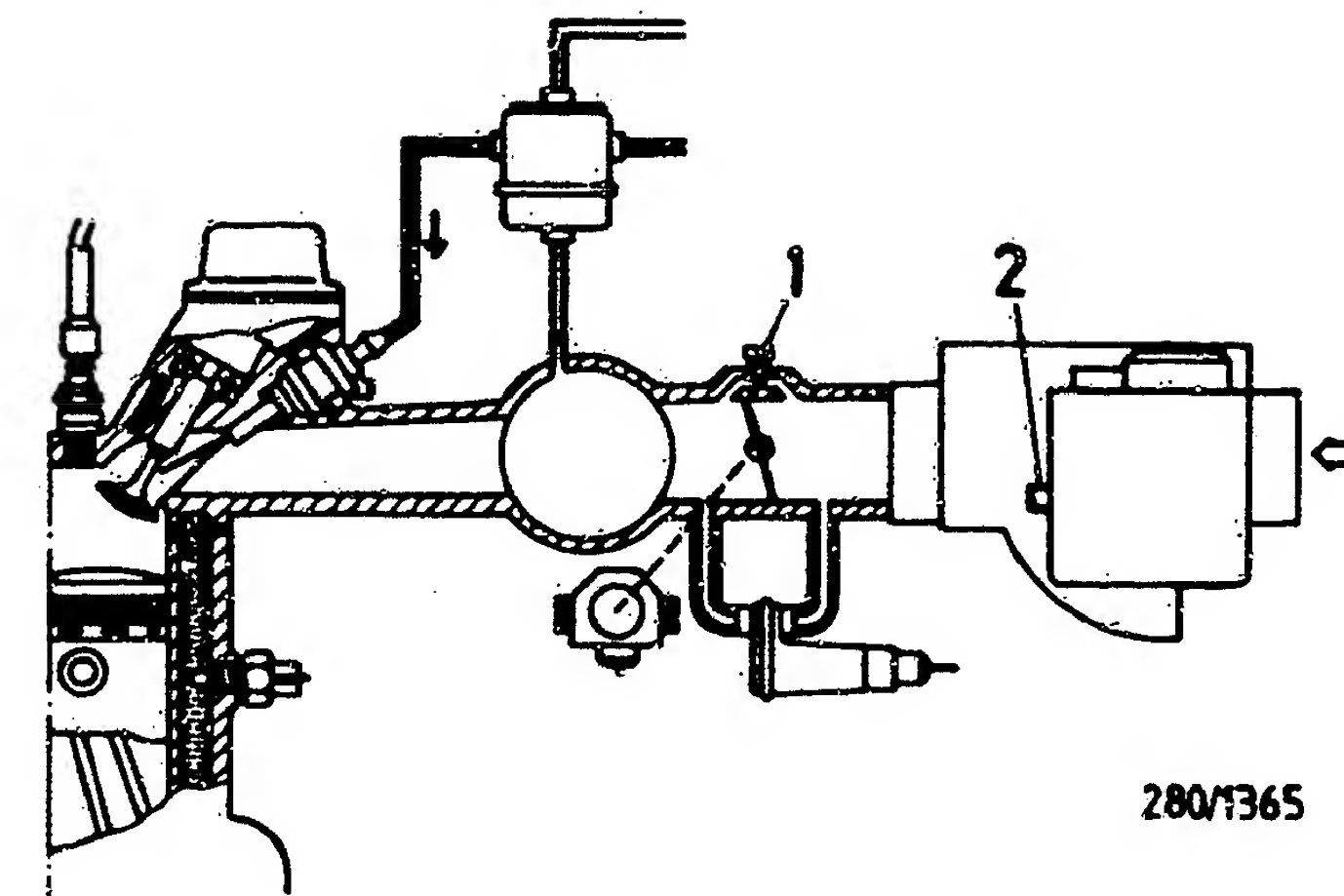
The L3.2-Jetronic makes use of lambda closed-loop control. The integrator voltage is measured instead of the CO content.

Refer to next micro-picture in the event of idle problems.

Y

V

Return to trouble-shooting chart B03



1 = Idle-speed bypass  
screw

2 = CO adjusting screw



# TROUBLE-SHOOTING PROGRAM (12)

## Test lambda sensor

The L3.2-Jetronic employs lambda closed-loop control. The integrator voltage is measured instead of the CO content.

Connect multimeter:  
(preferably analog version)

- \* Positive to measurement output, lambda closed-loop control, control unit term. 10. Refer to brief instructions for installation location.
- \* Negative to engine ground.
- \* Measuring range approx. 15 V.

Conditions:

- \* Engine at operating temperature approx. +80°C
- \* No leaks in exhaust system.
- \* Short-circuit idle and full-load switches to vehicle ground.

Set value: Uniformly fluctuating reading between 0...13 V.

Is set value attained?

N>

## Trouble-shooting:

Use ohmmeter to test following leads for continuity approx. 0  $\Omega$ ,

- \* From heater plug to pump relay term. 87.
  - \* From heater plug to vehicle ground.
  - \* From sensor housing to vehicle ground.
- Detach control-unit plug.  
From sensor plug to control-unit plug term. 13.

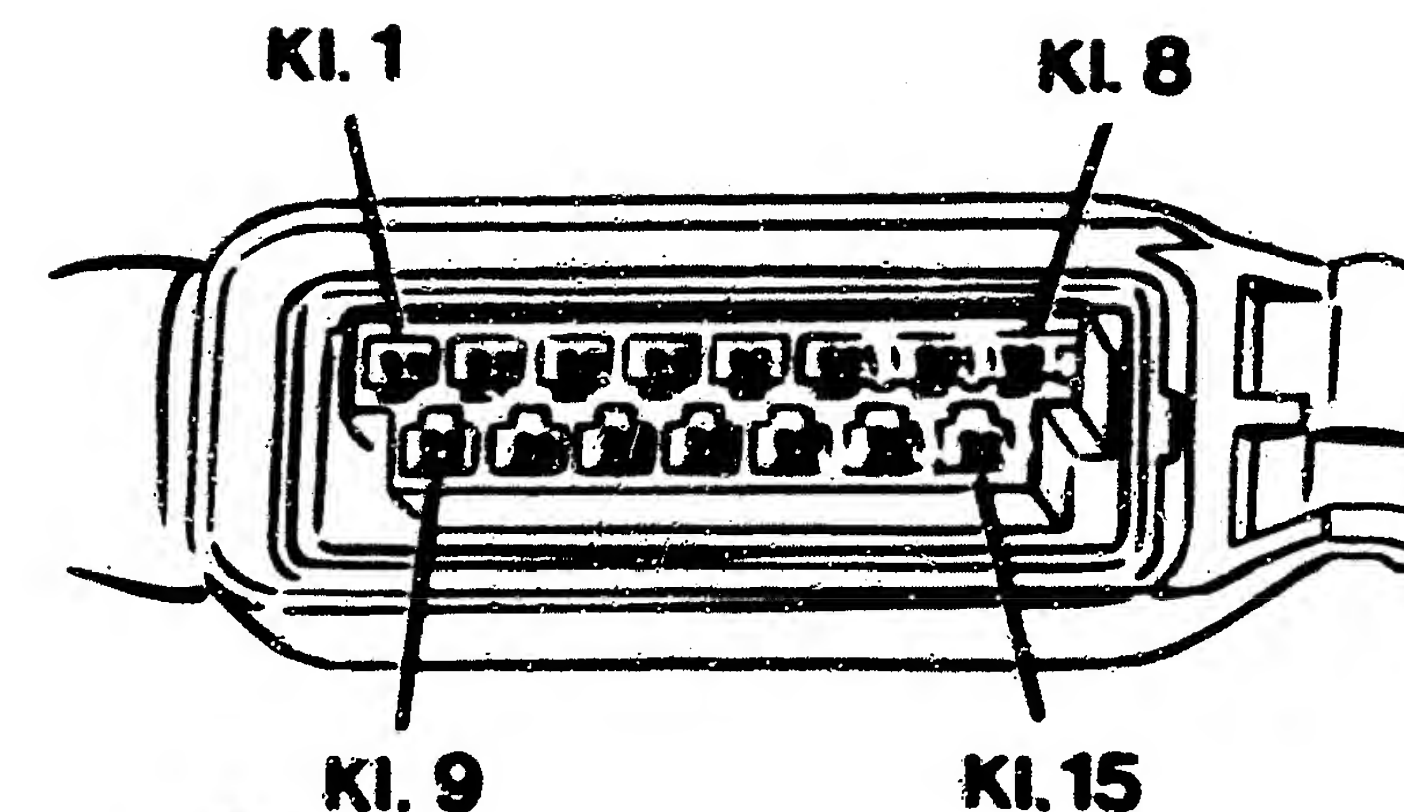
Test shield term. 5 to sensor lead term. 13,  
resistance at least 1 M  $\Omega$ .  
Attach control-unit plug.

Run engine at operating temperature  
If set value is now attained  $\rightarrow$  continue with next micro-picture.

If reading is 8...15 V  $\rightarrow$   
test sensor heater,  
internal resistance: 1...15  $\Omega$ .

Use digital multimeter  
(R<sub>i</sub> greater than 1 M  $\Omega$ ) to measure sensor signal with respect to ground.  
Sensor voltage: 0.05...1.0 V.  
If a value is not attained  
 $\rightarrow$  renew lambda sensor.

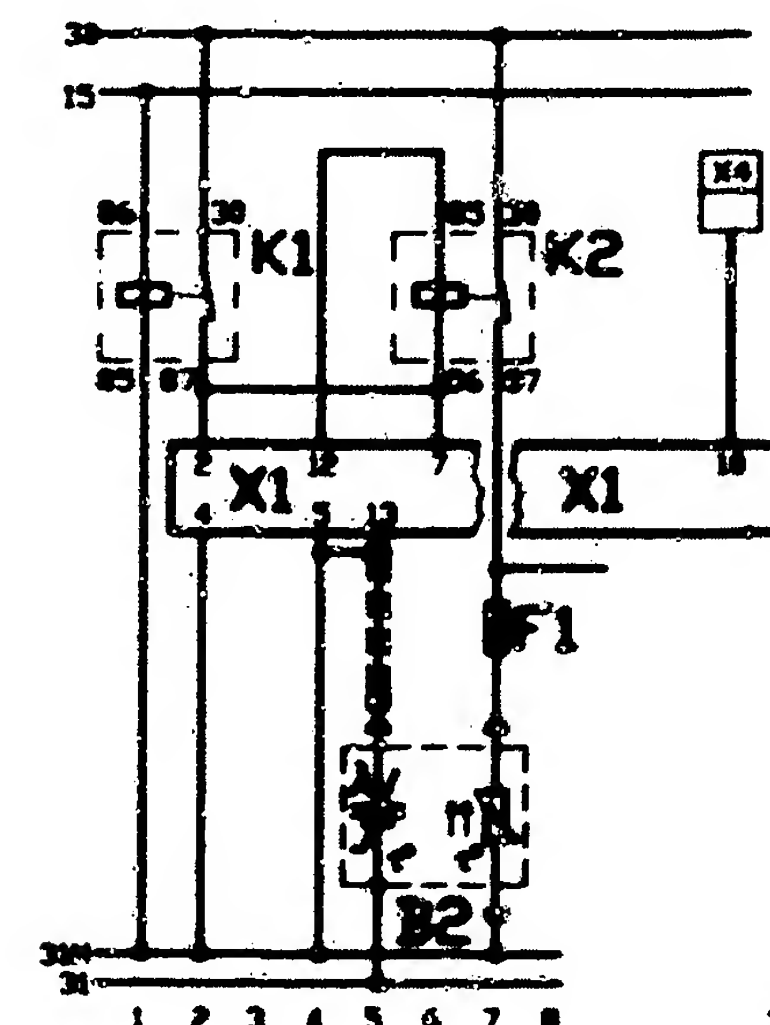
Only coat sensor thread with a small amount of grease Vs 140 16 Ft.



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Top view of control-unit plug

B2 = Heated lambda sensor  
K1 = Main relay  
K2 = Pump relay  
X1 = Control-unit plug  
X4 = Test output for lambda closed-loop control (Diagnosis output)



52001531

Continued on next picture page

# TROUBLE-SHOOTING PROGRAM (12) CONTINUED ( 1 )

Test lambda closed-loop control  
(control-unit functions)

Conditions:

- \*Engine at operating temperature approx. +80°C
- \*Short-circuit idle and full-load switches to vehicle ground.

Disconnect lambda-sensor plug.

Simulation of lean mixture:  
Connect signal lead on control-unit end to ground.  
There must be an increase in integrator voltage.  
Set value: 10...13 V.

Simulation of rich mixture:  
Apply 1.5...2.0 V to lead on control-unit end.  
There must be a drop in int. volt.  
Set value: less than approx. 0.5 V.

Is set value attained?

N>

Check following lead for continuity with ohmmeter, set value approx. 0  $\Omega$  !  
From control-unit plug term.13 to sensor plug.

Check following lead for insulation with ohmmeter, set value greater than 1 M  $\Omega$   
From control-unit plug term.13 to vehicle ground.

If set value is not obtained, replace control unit.

Integrator-voltage test

Connect up lambda-sensor plug.

Set value: Uniformly fluctuating reading between 0...13 V.

Is set value attained?

N>

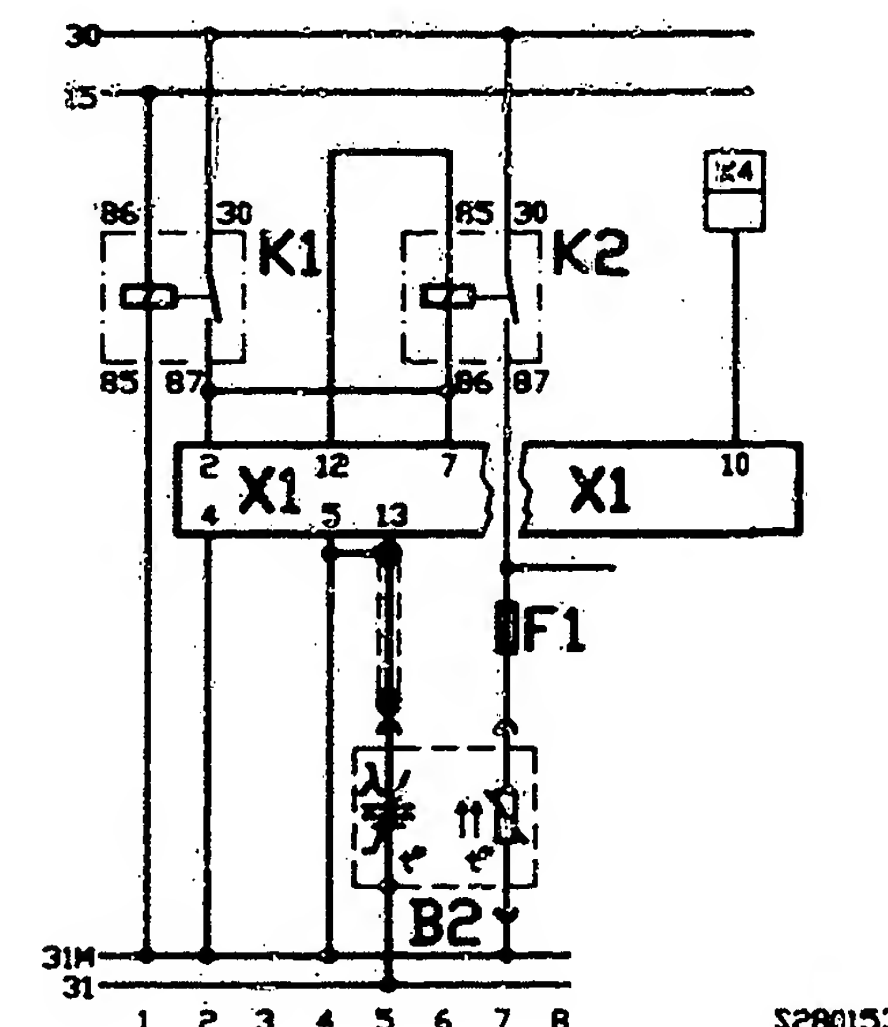
Adjustment:

Lever out large securing cap (on side of control unit).

Turn CO adjusting screw until reading fluctuates uniformly between 0...13 V.

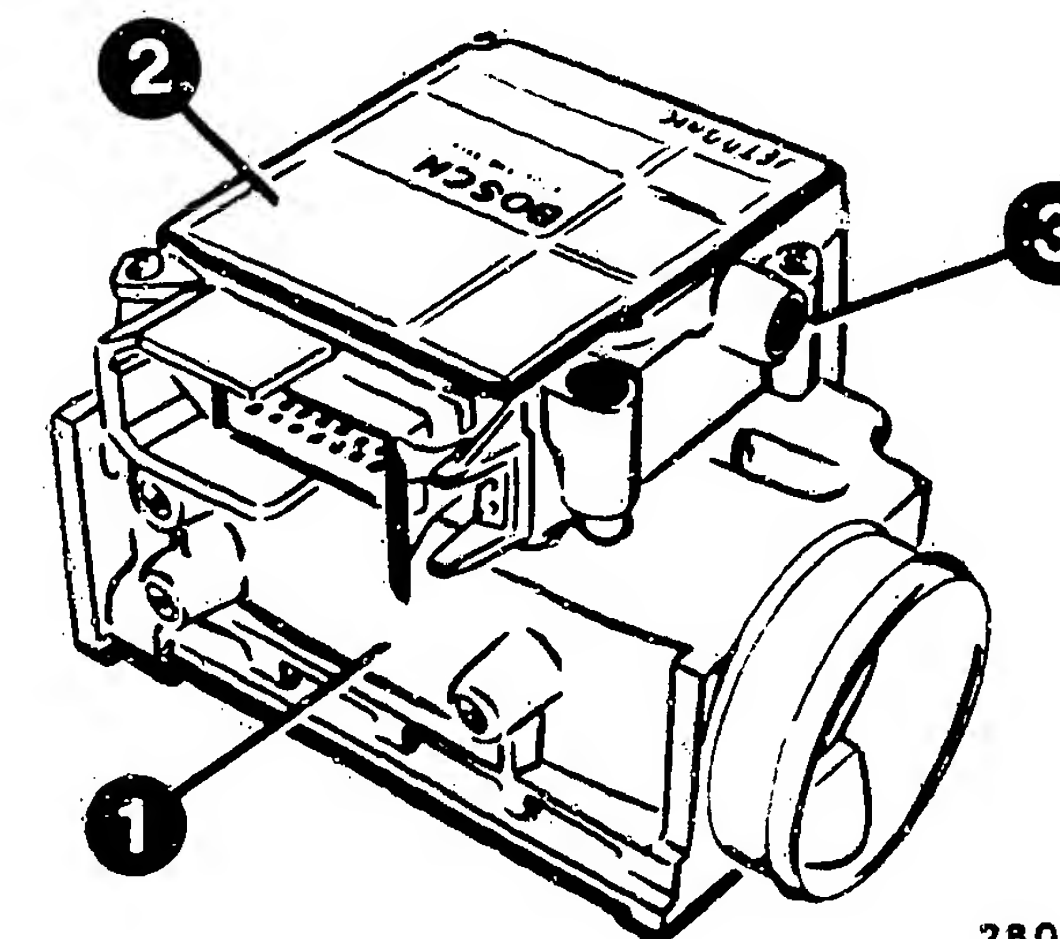
Press in new securing cap.

Return to trouble-shooting chart B03



B2 = Heated lambda sensor  
K1 = Main relay  
K2 = Pump relay  
X1 = Control-unit plug  
X4 = Test output for lambda closed-loop control (Diagnosis output)

1 = Air-flow sensor  
2 = Control unit  
3 = Anti-tamper cap for CO adjusting screw



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# TROUBLE-SHOOTING PROGRAM (14)

V

Test exhaust-gas catalytic converter.

N>

Conditions:

\*Lambda closed-loop control must be in proper working order.

\*There must be an exhaust-gas sampling point upstream of the catalytic converter.

If not, unscrew lambda sensor and screw in adapter (self-produced with M 18x1.5 thread).

\*Engine at operating temperature, approx. 80°C.

\*Disconnect lambda-sensor plug (open-loop control).

Measure CO contents upstream and downstream of catalytic converter. Front sampling point must be sealed off when taking measurement downstream of catalytic converter. Note down both values.

Set value: CO content downstream of catalytic converter must be clearly lower than ahead of it.

Is set value attained?

Y

V

Remove adapter and screw in lambda sensor.

Connect up sensor plug (closed-loop control).

Y

V

Return to trouble-shooting chart B03

V

If the two CO values are virtually identical, the catalytic converter is clogged and having no effect (e.g. due to leaded fuel).

Renew catalytic converter.



# TROUBLE-SHOOTING PROGRAM (15)

Check tank-ventilation system.

Check visually whether hoses of tank-ventilation system are correctly attached, not bent or damaged.  
Check whether hose connections at intake manifold, tank bleeder valve, active-carbon canister and fuel tank are leak-tight.

Are all hoses and connections O.K.?

Replace defective hoses as necessary.  
Eliminate leakages by tightening hose clamps.

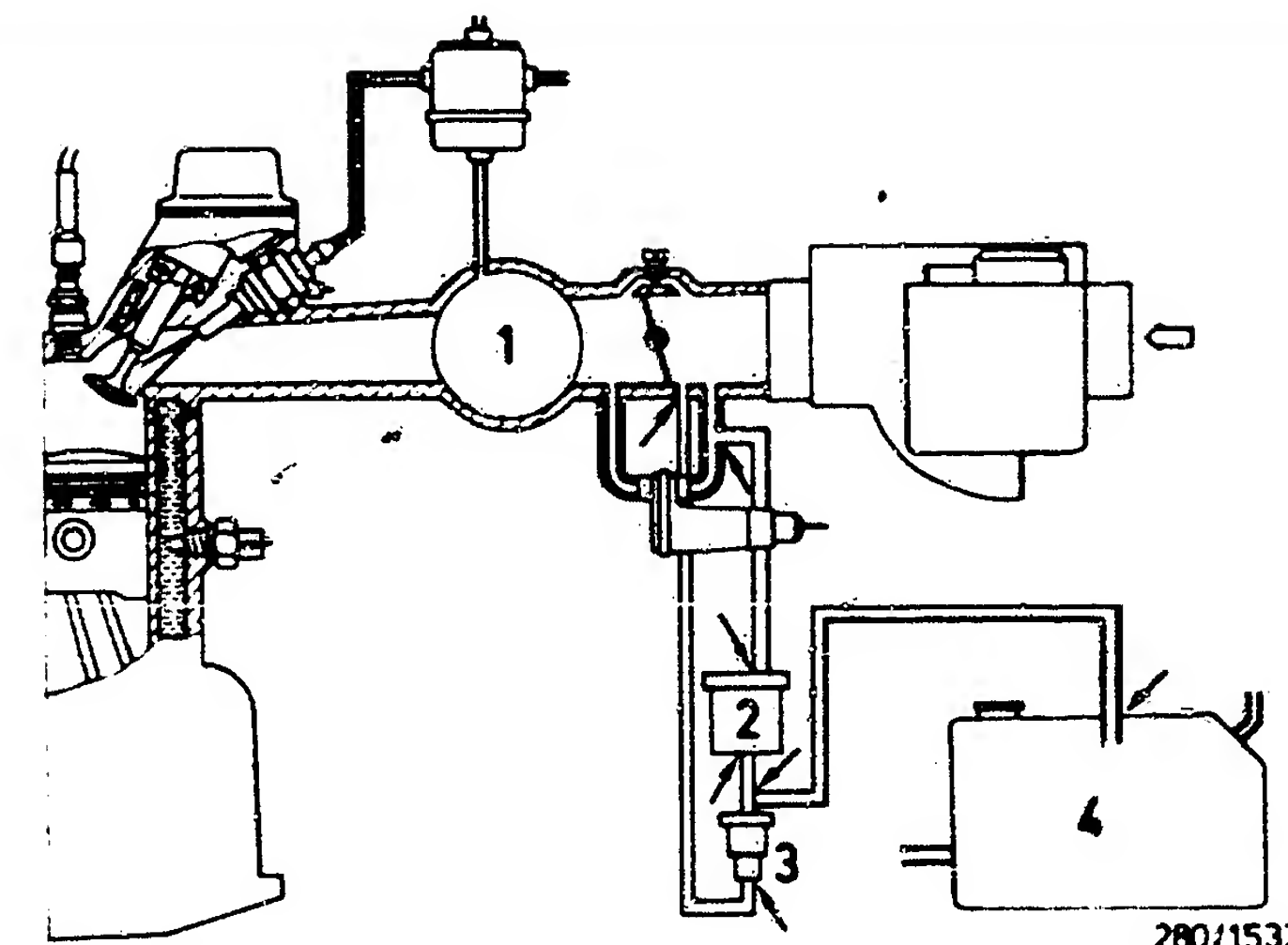
The tank ventilation valve operates without electrical actuation. It is opened by the intake-manifold pressure when the throttle valve is open (particularly in part-load range). The active-carbon container is thus flushed with fresh air.

The tank ventilation valve must be free from leaks in the idle range.

Are all functions of the tank ventilation valve O.K.?

Renew defective intake-manifold-pressure actuator or defective tank ventilation valve.

Return to trouble-shooting chart B03



1 = Intake manifold  
2 = Active-carbon container  
3 = Tank ventilation valve  
4 = Fuel tank

Arrows = possible leakage points

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